Proposed Mining Plan, East Gillette Federal Mine, Campbell County, Wyoming

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Draft Environmental Impact Statement
OSM-EIS-15

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U.S. Office of Surface Mining Reclamation and Enforcement

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COVER SHEET

Proposed action: Approval of a mining plan submitted by Kerr-McGee Coal Corporation for the East Gillette Federal mine and issuance of a Federal permit to mine coal.

Type of statement: Draft environmental impact statement (EIS)

Lead agency: Office of Surface Mining Reclamation and Enforcement (OSM)

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Abstract: Kerr-McGee Coal Corporation proposes to mine an average of 11 million tons of coal per year, or 256 million tons of coal over a 25-year period, at its East Gillette Federal mine. The proposed mine would disturb 2,604 acres of land. Six coal mines are currently in operation, and one more is proposed for operation, in the general vicinity of Kerr-McGee's proposed mine. If approved, mining and related activities at the East Gillette Federal mine would have major short-term impacts upon the vegetation and visual resources of the area. Impacts to certain socioeconomic resources of the area would be moderate. If start-up of the operation were delayed for several years, the impacts to the socioeconomic environment could be major owing to a cumulative effect with other mining operations in the area. Mining would have major long-term impacts upon geologic strata and soils. Impacts to air quality, topography, transportation, and ground water would be moderate. Other impacts would be typical of those resulting from surface coal mining operations in northeastern Wyoming and would be minor.

Comments regarding this draft EIS must be received by: Please see insert sheet.

Please retain your copy of this draft EIS. Unless public comment is so extensive as to require that the draft EIS be commensurately revised, the **final EIS document** is anticipated to consist of public comments on the draft EIS and of OSM responses to these comments. Copies of the final EIS will be sent only to those agencies and organizations listed in chapter V, to those who comment on this draft EIS, and to those who specifically request a copy of the final EIS.

PREFACE

This environmental impact statement (EIS) analyzes the impacts on the human environment that would result from surface coal mining operations at Kerr-McGee Coal Corporation's proposed East Gillette Federal mine. A decision by the Secretary of the Interior on Kerr-McGee's mining plan is required by the Surface Mining Control and Reclamation Act of 1977.

This EIS consists of seven chapters. Chapter I describes the proposed action and the purpose of and need for the action and provides background information. Chapter II describes and compares the alternatives evaluated in this EIS for the decisionmaker and the public. The alternatives include: alternative A, approval of the mining plan, with or without conditions, and issuance of a Federal permit to mine coal, and alternative B, disapproval of the mining plan, in which case no Federal permit to mine coal would be issued. Alternative A is the OSM preferred alternative.

Chapter III describes the existing environment that would be affected by the proposed action. Chapter IV describes and analyzes the environmental impacts that would result from the proposed action.

Chapter V lists those government agencies and private organizations from which comments are being solicited. Chapter VI lists, with their qualifications, the individuals who prepared the environmental analyses and prepared this document. References cited in this document are listed in chapter VII.

SUMMARY

This environmental impact statement (EIS) analyzes the impact on the human environment that would result from approval of the mining plan and issuance of a Federal permit by the Office of Surface Mining Reclamation and Enforcement (OSM) for Kerr-McGee Coal Corporation's proposed East Gillette Federal mine. Concurrent with this draft EIS preparation, a technical environmental analysis of Kerr-McGee's permit application package (PAP) is being prepared by the Wyoming Department of Environmental Quality to determine Kerr-McGee's compliance with the Wyoming Environmental Quality Act.

Kerr-McGee has submitted a PAP for approval of its mining plan and issuance of a Federal permit to mine coal in accordance with the requirements of the Mineral Leasing Act of 1920, as amended (30 USC 181 et seq.), the Surface Mining Control and Reclamation Act of 1977 (30 USC 1201 et seq.), the State of Wyoming's cooperative agreement, and regulations implementing the Wyoming Environmental Quality Act. Because Kerr-McGee has fulfilled the requirements of its leases and has filed a complete PAP with OSM, a decision by the Secretary of the Interior regarding approval of the mining plan and issuance of a Federal permit is required by law. This draft EIS analyzes two alternative decisions, or "actions," the Secretary could take. The two actions are: approval of the mining plan, with or without conditions to bring it into full compliance with State and Federal regulations, and issuance of a Federal permit (alternative A), or disapproval of the mining plan, in which case no Federal permit would be issued (alternative B, equivalent to the "no action" alternative). OSM has chosen alternative A as its "preferred alternative."

Brief description of the proposal

Kerr-McGee proposes to open the East Gillette Federal surface coal mine in the eastern Powder River Basin, Campbell County, Wyoming, 3 miles east of Gillette. The permit area, comprising 3,246 acres of gently rolling topography, is used for ranching and wildlife and, to a limited extent, for agriculture. Kerr-McGee would extract 256 million short tons of low-sulfur subbituminous coal during 25 years and, in the process, would disturb 2,604 acres. The average annual production rate would be 11 million tons, with a peak production of 12 million tons per year. A description of the proposed mine is presented in appendix A.

Summary of impacts

OSM's analysis indicates that the East Gillette Federal mine would have major impacts upon geology, soils, vegetation, and visual resources on the minesite. However, these impacts would be comparatively small relative to the overall resources of the entire area. Moderate impacts to air quality, topography, ground water, transportation, and socioeconomics (construction phase) would also occur. Taken in context, all other impacts would be minor, even when considered cumulatively with those from the other seven existing or proposed mines in the area.

If the mining plan were not approved and a Federal permit were not issued, the adverse environmental impacts associated with the approval alternative would not occur. Any mining or other resource uses needed to meet energy demands would occur elsewhere. State and local governments would not receive the 50-

percent share of Federal coal royalties. An estimated 728 direct and indirect jobs would not develop.

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CHAPTER I

INTRODUCTION

The proposed Federal action analyzed in this draft environmental impact statement (EIS) is approval of the mining plan submitted by Kerr-McGee Coal Corporation (hereinafter, Kerr-McGee) for the proposed East Gillette Federal mine and issuance of a Federal permit to mine coal. Conditions would likely be incorporated into the Federal permit by the Wyoming Department of Environmental Quality (DEQ) and the Office of Surface Mining Reclamation and Enforcement (OSM). These conditions could be necessary to bring the mining plan into full compliance with the Permanent Regulatory Program of OSM and the Wyoming Environmental Quality Act, carrying out the Surface Mining Control and Reclamation Act of 1977 (SMCRA), conditions of the Federal coal leases, and all other applicable Federal laws. Copies of Kerr-McGee's permit application package (PAP), which contains the mining plan, and of the supporting data can be reviewed by the public at the OSM Western Technical Center, Brooks Towers, 1020 -15th Street, Denver, Colorado; OSM Casper Field Office, 935 Pendell, Mills, Wyoming; Wyoming Department of Environmental Quality, Equality State Bank Building, 401 West 19th Street, Cheyenne, Wyoming; and the Campbell County Clerk's Office, 500 South Gillette Avenue, Gillette, Wyoming.

A. NEED FOR FEDERAL DECISION

Kerr-McGee holds three Federal coal leases in the eastern Powder River Basin. It has met all terms of the leases and has submitted a complete PAP to mine the coal. Therefore, the Secretary of the Interior is required to make a decision on the mining plan. This EIS analyzes the environmental consequences of the alternative decisions, or "actions," available to the Secretary.

SMCRA authorizes the regulatory authority to issue permits for a term of up to 5 years, with certain exceptions. SMCRA further provides the right of successive permit renewal in 5-year increments for the coal mining operations area covered by the permit. The permit area is defined in the applicant's PAP and includes all areas where surface mining and reclamation operations would occur. It includes the actual area mined and the area disturbed by associated surface facilities and haul roads.

B. SCOPE OF THE ANALYSIS

OSM has prepared this EIS to analyze the environmental impacts of the proposed Federal action. The technical information on which this analysis is based is contained in the PAP. The impacts discussed focus on the proposed permit area and include direct impacts from mining, offsite impacts caused by mining, such as changes in hydrologic conditions and air quality, and other impacts, primarily social and economic, resulting from increased employment and economic activity. The analysis extends beyond the permit area to the remainder of the life-of-mine area, to the extent additional information is available.

C. BACKGROUND

The East Gillette Federal mine would occupy all or part of three Federal coal leases (W-0311810, W-0312311, and W-0313668) held by Kerr-McGee. The total Federal leasehold encompasses 4,343 acres of coal and, locally, other minerals. The actual permit area, however, would encompass 3,246 acres. Kerr-McGee owns 75 percent of the surface of the permit area. Other companies own 7 percent, the State of Wyoming owns 15 percent, and private individuals own 3 percent.

Kerr-McGee proposes to mine 256 million tons of low-sulfur subbituminous coal over a 25-year period from the three Federal leases. The coal would be mined by surface methods and transported by unit trains to electric generating plants. No contractual commitments for the coal currently exist.

A draft EIS prepared by the U.S. Geological Survey for the East Gillette Federal mine was submitted for public review and comment on April 1, 1977 (U.S. Geological Survey, 1977). A scoping meeting on the then-proposed East Gillette Federal mine was held in Gillette, Wyoming, on April 17, 1980, and the comments received were used in the preparation of this EIS.

Since 1980, Kerr-McGee has made several revisions to its plans for mining the coal to meet requirements of SMCRA, OSM, and Wyoming DEQ. Because of these revisions and the amount of time elapsed, the East Gillette Federal mine draft EIS prepared by the U.S. Geological Survey has been withdrawn, and this new draft prepared. This new draft EIS is based on the 1977 draft and on the current PAP, which was filed by Kerr-McGee with OSM and Wyoming DEQ on August 20, 1982. Major changes in the new PAP are:

- The period of coal mining has been reduced from 35 to 25 years.
- The anticipated total production has been reduced from 338.9 million tons to 256 million tons, because:
  - . although lease W-0311810 includes all of secs. 5 and 6, only the W½ sec. 6 would be mined due to lack of surface-owner consent to mine the other portions of those sections, and
  - . the W½SW¼ sec. 27, the NW¼NW¼ sec. 33, and the NW¼NW¼ sec. 34 would not be mined due to potential conflict with Donkey Creek being designated an alluvial valley floor (AVF).
- The total area to be disturbed has been reduced from 2,919 acres to 2,604 acres.
- No permanent overburden stockpiles would remain after final reclamation.
- Mining would not affect any producing oil wells.
- The planned final contours after reclamation have been adjusted to more closely blend into adjacent areas.

- The anticipated maximum employment has increased from 242 to 331.

The new PAP also has many minor changes and includes considerably more supporting data than did the original mining and reclamation plan. The net result of these changes from the original plan would be to reduce the adverse impacts of the proposed operations on the environment. OSM initiated work on a new draft EIS based on the new PAP in mid-1983. A 30-day scoping period on the new EIS ended on October 24, 1983. No comments were received.

In reviewing the PAP, the EIS team identified hydrology and overburden as subjects of particular concern relative to mining the East Gillette Federal mine. Specifically, the team asked:

- What are the cumulative effects of water drawdown of the Fort Union Formation by the East Gillette Federal and surrounding mines, the City of Gillette, and other users?

- What are the local hydrologic consequences to aquifer recharge and nearby water wells resulting from the reduction of the internal drainage area of Ditto Lake and the reestablishment of two other internal drainage basins?

- Will the visual assessment of the highwall as proposed by the applicant, and the core-hole data furnished by the applicant, be sufficient to evaluate the potential toxic and/or acid-forming characteristics of the overburden?

D. RELATION TO OTHER DEVELOPMENT

Coal Mines

Coal mining at the proposed East Gillette Federal mine would be part of the regional coal development more fully evaluated by the Bureau of Land Management (BLM) in two EIS's on the eastern Powder River Basin (Bureau of Land Management, 1974, 1979a). Figure I-1 shows the location in Campbell County of 18 operating or proposed coal mines. Table I-1 shows the estimated coal reserves, average annual production, and permit-area acreages for 20 coal mines in Campbell and Converse Counties for which mining and reclamation plans or PAP's have been submitted to OSM. The proposed East Gillette Federal mine would account for approximately 5 percent ot the total coal reserves, 5 percent of the average annual production, and 3 percent of the total surface acreage of the 20 mines listed in table I-1.

Kerr-McGee also holds Wyoming State lease 0-26651, on secs. 9 and 16, T. 50 N., R. 71 W., which are immediately adjacent to the proposed East Gillette Federal mine. Production from the Clovis Point mine, located on this lease, began in August 1979 as a separate operation not connected with the proposed East Gillette Federal mine.

The Wyodak Resources Development Corporation (Wyodak) is mining coal in sec. 28, immediately east of the proposed East Gillette Federal mine. Kerr-McGee and Wyodak signed a mutual easement agreement on May 13, 1976, to

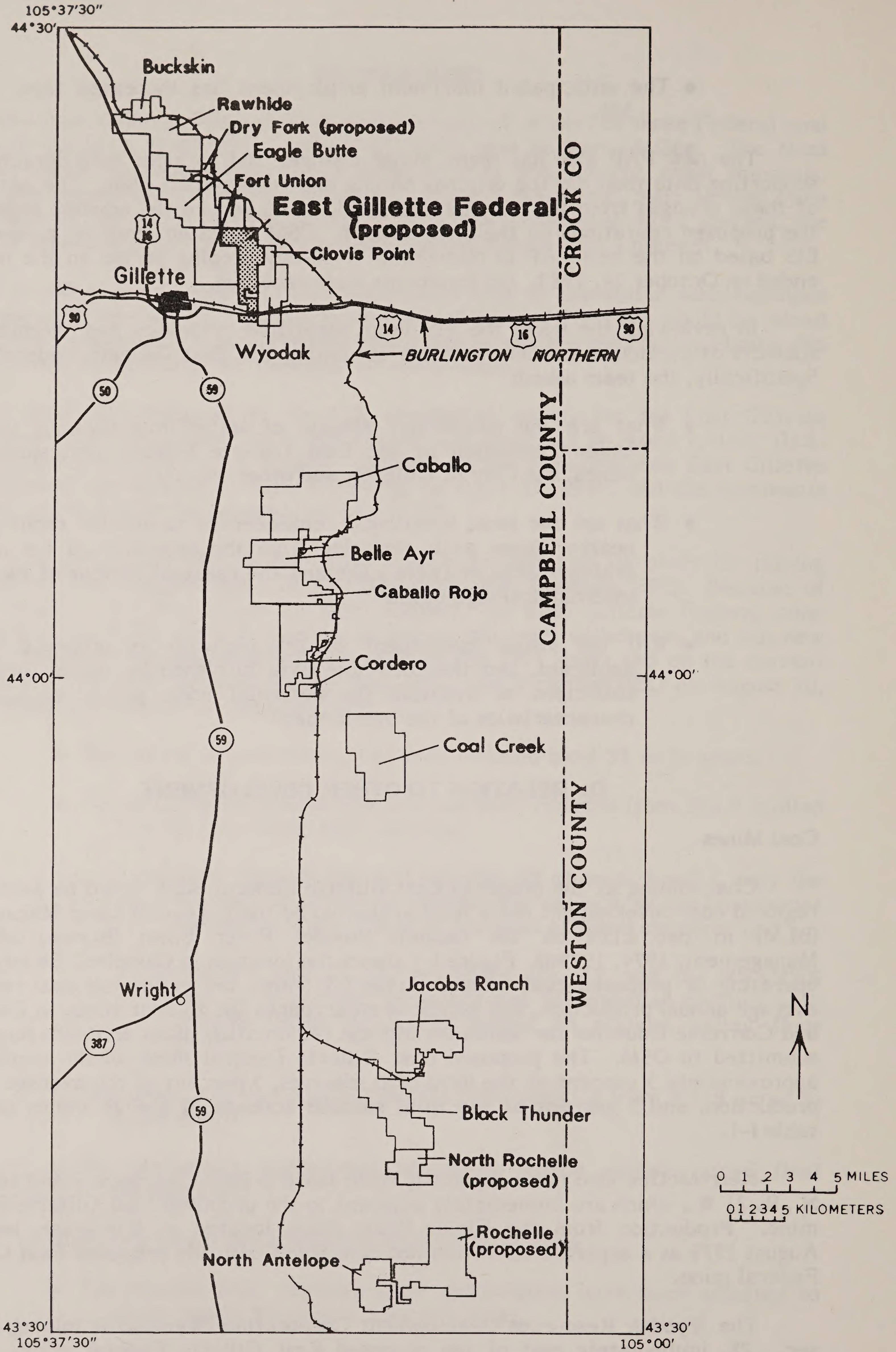

Figure I-1.--Location of existing and proposed coal mines in Campbell County.

Table I-1.--Estimated coal reserves, average annual production, and surface acreage of existing and proposed coal mines in Campbell and Converse Counties

Company (mine name)	Coal reserves[1] (million tons)	Average annual production (million tons)	Permit area (acres)
Amax (Belle Ayr)	331	15	7,007
Amax (Eagle Butte)[2]	556	16	4,905
ARCO (Black Thunder)	724	20	6,524
ARCO (Coal Creek)	340	12	6,720
Carter Oil (Caballo)	719	12	10,122
Carter Oil (Rawhide)[2]	752	5	7,393
Fort Union Mine Partnership (Fort Union)[2, 4]	810	15	5,088
Glenrock Coal Company (Dave Johnston)	58	4	16,133
Kerr-McGee (Clovis Point)[2]	85	4	1,371
Kerr-McGee (East Gillette Federal)[2, 3]	287	11	3,246
Kerr-McGee (Jacobs Ranch)	300	9	4,352
Mobil (Caballo Rojo)	437	17	7,025
NACC (North Antelope)	200	5	3,762
NERCO (Antelope)	263	12	7,641
Peabody (Rochelle)[3]	498	10	6,660
Phillips (Dry Fork)[2, 3]	251	11	3,798
Shell (North Rochelle)[3]	202	7	4,587
Sun Oil (Cordero)	337	12	3,800
Triton (Buckskin)[2]	144	6	1,467
Wyodak Resources (Wyodak)[2]	160	5	3,274
Total	7,517	208	114,875

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[1] The approved or proposed mining-plan area may not include all of the total coal reserves on the leasehold.

[2] Existing and proposed mines covered under cumulative impacts in this EIS.

[3] Proposed mines in Campbell and Converse Counties.

[4] This mine has submitted a PAP to expand its operation onto a Federal lease adjacent to its existing operation.

maximize coal recovery by allowing overstripping along their mutual boundaries. Overstripping is removal of overburden on adjacent land so that coal can be mined up to the lease boundary.

Fort Union Mine Partnership has recently acquired the rights to mine the lands formerly proposed for mining as the South Rawhide mine. These lands are located immediately west of the proposed East Gillette Federal mine; Fort Union Mine Partnership has submitted a new PAP to OSM to incorporate these lands as pit No. 2 of its nearby existing Fort Union mine.

The Cities Service Company acquired the lease north of the East Gillette Federal mine and submitted a PAP for its proposed Dry Fork mine. Cities Service Company subsequently sold its lease to the Phillips Coal Company. Kerr-McGee will need to sign an overstripping agreement with Phillips to obtain maximum coal recovery in sec. 6.

Oil and Gas

Davis Oil has a producing gas well in the NW¼NE¼ sec. 8, and Pan American Petroleum has two inactive oil wells in the NW¼ sec. 8. There also are four dry holes and one abandoned well within the permit area.

E. THE APPLICANT'S PROPOSAL

After receiving a Federal permit to mine coal, Kerr-McGee would need about 2 years for initial surveying, completion of access roads and equipment assembly areas, clearing of land, and erection of various buildings and other structures, before surface mining operations could begin. Table I-2 shows the schedule of mining activities and employment.

Peak production is expected about 15 years after mining starts, after a second pit is opened. An average of 11 million tons would be mined annually (table I-2). Approximately 60 to 100 acres would be disturbed by mining each year, with no more than 1,000 acres being utilized for surface facilities, mining, roads, and backfilling in any one year. A total of 2,604 acres would be disturbed.

A more detailed discussion of the PAP is given in appendix A.

Table I-2.--Schedule of yearly coal production, surface disturbance, and employment for the East Gillette Federal mine

(Projections supplied by applicant)

	Year of mining								
	-2	-1	1	2	5	10	15	20	25
Coal production, in millions of tons	0	0	4	6	11	11	12.3	11	3
Average number of unit trains loaded per week	0	0	7	12	21	21	24	22	6
Approximate annual surface acreage disturbed by mining and surface facilities	250	89	76	272	100	76	60	95	0
Approximate annual surface acreage reclaimed	0	0	0	0	88	78	80	62	75
Number of construction employees	55	120	11	0	0	0	0	0	0
Number of salaried mining employees	0	0	6	32	57	57	57	57	30
Number of hourly mining employees	0	0	54	120	274	274	274	274	38
Total employees	55	120	71	152	331	331	331	331	68

CHAPTER II

ALTERNATIVES

This EIS evaluates two alternative actions that cover the range of decisions available to the Secretary of the Interior regarding the mining plan for Kerr-McGee's proposed East Gillette Federal mine. The first alternative available to the Secretary (alternative A) is approval of the mining plan, with or without conditions to bring it into compliance with Federal and State regulations, and issuance of a Federal permit to mine coal; OSM has chosen alternative A as its "preferred alternative." The second alternative available to the Secretary is alternative B, disapproval of the mining plan, in which case no Federal permit to mine coal would be issued.

In addition to these two alternatives, OSM evaluated other alternatives that it found to be not reasonable. The no action alternative was evaluated by OSM and was determined to be not reasonable because Kerr-McGee has fulfilled the requirements of its leases and has filed a complete PAP with OSM. Therefore, a decision by the Secretary regarding approval of the mining plan and issuance of a Federal permit is required by law. However, the impacts to the human environment of implementing the no action alternative would be the same as those of implementing alternative B. For the purposes of this EIS, these alternatives are considered equivalent and the no action alternative is not analyzed further in this document.

The second alternative OSM considered but found to be not reasonable was for the Secretary to delay his decision to approve or disapprove Kerr-McGee's mining plan. In 1977, local residents suggested that delaying construction and operation of the mine for 2 years or more could enable the City of Gillette to provide adequate or better services for the increased population resulting from this proposed mine as well as from other energy projects in the area. However, since that time the demand for coal has dropped. In consequence, fewer mines have been opened than was anticipated in 1977 and both coal production and work forces at many existing mines have been reduced. Because of the changed socioeconomic environment, the opening of a new mine now could have more beneficial and less adverse impacts on the socioeconomics of Gillette and Campbell County than were anticipated in 1977. Thus, for the Secretary to delay his decision on Kerr-McGee's mining plan could, in fact, increase socioeconomic problems for the city and county, because the East Gillette Federal mine might then commence operation in an improved coal market at the same time other existing mines were increasing their production. Should this happen, the cumulative impact of the East Gillette Federal mine and the other mines to the socioeconomics of the area could be more adverse than if the Secretary chose to approve the mining plan without delay (alternative A). For these reasons, OSM rejected the deferral alternative.

Alternatives to the leasing and development of coal resources in the eastern Powder River Basin have been analyzed in the regional analysis portions of the EIS's prepared by BLM evaluating the proposed development of coal resources in the basin (Bureau of Land Management, 1974, 1979a) and in the final EIS on the Federal Coal Management Program (Bureau of Land Management, 1979b).

A. DESCRIPTION OF ALTERNATIVES ANALYZED

Under alternative A, the Secretary would approve Kerr-McGee's mining plan with or without conditions necessary to meet the requirements of SMCRA (P.L. 95-87), the Permanent Regulatory Program regulations (30 CFR 740) implementing SMCRA, the State of Wyoming Environmental Quality Act, the conditions of the three Federal leases, and all other applicable Federal laws (such as the Federal Land Policy and Management Act, the Endangered Species Act, the National Historic Preservation Act, the Archeological and Historic Preservation Act, the Antiquities Act, the Clean Air Act, and the Clean Water Act). He would also issue a Federal permit to mine coal.

Environmental consequences associated with mining under alternative A are described in chapter IV. The impacts to the socioeconomics of the area resulting from the operation of a mine could differ according to whether Kerr-McGee commenced operations shortly after issuance of the Federal permit or instead delayed construction of the mine up to 3 years in accordance with 30 CFR 786.25(b)(1), which requires commencement of surface coal mining operations within 3 years of the issuance of a 5-year permit. The impacts dependent on these two possible mining commencement dates are discussed separately in the "Socioeconomics" section of chapter IV.

Under alternative B, the Secretary would not approve Kerr-McGee's mining plan or issue a Federal permit. This alternative is eqivalent to no action; if the Secretary were to choose it, the company could not obtain a Federal permit to mine the coal. About 256 million tons of coal would not be mined and a yearly average construction force of about 88, as well as a peak permanent work force of about 331, would not be employed.

B. COMPARISON OF ALTERNATIVES

If the Secretary chose alternative A, the East Gillette Federal mine would not interfere with the future use of the region's renewable resources. Environmental consequences of the East Gillette Federal mine would be about the same as those from the other existing coal mines of the same size (11 million tons of coal per year) in the basin. The environmental costs of mining the 256 million tons of coal would not be appreciably lessened by using a different method of mining other than surface mining because of (1) the large amount of coal available at Kerr-McGee's proposed site per unit of land surface to be disturbed, (2) the shallow depth of the coal, as demonstrated by the low overburden to coal ratio, (3) the availability of rail transportation, and (4) the absence of threatened or endangered species on the site.

Under alternative A, the following environmental impacts would occur:

- During mining, the geologic strata (coal and overburden) up to a maximum depth of 341 feet, soils, and vegetation on as much as 2,604 acres of the minesite would be progressively disturbed. Changes in stratigraphy would be permanent. The overall land surface would be lowered an average of 53 feet. Soil structure would be changed. The vegetative productivity and the use of the entire minesite (currently, grazing and wildlife) should be restored to premining levels within about 40 years after mining begins.

Although vegetation would support a land use similar to that before mining, postmining vegetation would be somewhat different from the existing vegetation. It is expected that wildlife populations forced to move during mining would return following reclamation.

- Mining and associated facilities would constitute a visual intrusion on the rural landscape during the construction and active mining phases. This intrusion would be similar to that of the six mines already operating in the area. During reclamation, the facilities would be removed and the area restored to its approximate original condition.
- Despite moderate degradation of air quality in the vicinity of the mine, the quality of the air would meet Federal and State standards.
- About 566 acre-feet of ground water would be used each year by the mine and by the increased population associated with the mine. The quality of the ground water in the replaced overburden would not be as good as present water quality (271 to 3,800 milligrams per liter (mg/L) of total dissolved solids (TDS)) but would still be acceptable for anticipated postmining agriculture and wildlife uses (3,000 to 5,000 mg/L TDS). Kerr-McGee is required to replace any developed water supply adversely affected by its mining.
- Traffic to and from the mine would increase the noise level and add to maintenance requirements of the roads. When the mine is at full capacity, four 100-car unit trains would convey coal from the mine and return each week. This would increase the noise and the possibility of accidents and delays at crossings along rail lines between the mine and powerplants.
- By 1990, the mine would contribute about 1,310 persons to the population of Campbell County. Such population increases would place a demand on the county government and the City of Gillette to provide services, especially police, fire, waste disposal, health, and recreation services. Because of increased sales tax collection, and the fact that the mine itself would increase the property valuation, Campbell County and the City of Gillette generally would be able to meet the demands. Should the applicant delay commencement of mining and reclamation operations for several years, the socioeconomic consequences could become major if the East Gillette Federal mine begins operation as existing and proposed mines increase or begin their coal production.

If the Secretary chose alternative B, the environmental consequences noted above would not occur on the three Federal leases. State and local governments would not receive the 50-percent share of the Federal coal royalties resulting from the proposed coal production.

CHAPTER III

DESCRIPTION OF THE AFFECTED ENVIRONMENT

A. CLIMATE

The climate in northeastern Wyoming is semiarid and windy, characterized by wide variations in diurnal and annual temperature and in seasonal and annual precipitation. Approximately 50 percent of the annual precipitation occurs from April through June; 75 percent occurs from April through September (National Oceanic and Atmospheric Administration, 1973). Hailstorms are the most destructive storms affecting the area, occasionally occurring during summer thunderstorms. Average annual snowfall is about 55 inches per year in the Gillette area. Potential evapotranspiration at Douglas, Wyoming (nearest site available), is 23 inches per year (National Oceanic and Atmospheric Administration, 1969). Average annual precipitation in the Gillette area is approximately 14 inches per year based upon climatological records from 1931 to 1970. The average annual precipitation from 1979 to 1982 at the proposed East Gillette Federal minesite has been 14.50 inches.

Diurnal temperature variations up to 40 or 50 degrees (^{o}) F are not uncommon during winter months in northeastern Wyoming. Summer daytime terperatures typically reach into the upper 80's or 90's, with occasional temperatures of over 100^{o}F possible. Winter nighttime temperatures often dip below zero during clear-sky and surface snow-cover conditions. Mean annual temperature at Gillette from 1941 to 1970 was 45.1^{o}F. The coldest month (January) averages 22^{o}F and the warmest month (July) averages 71^{o}F. The growing season (frost-free days) lasts approximately 130 days, beginning in mid-to late May and ending in mid- to late September.

The average wind speed in the Gillette area is 12 miles per hour, although wind gusts over 50 miles per hour may occur rather frequently during the daytime. Regionally, winds are dominated by prevailing westerlies, modified by major topograhic features into northwesterly winds with a secondary flow from the southeast during the summer. The occurrence of numerous low-relief features in the Gillette area, combined with the prevailing westerly winds, is not conducive to the formation of long-duration temperature inversions. On the average, air stagnation events occur 15 times each year, lasting an average of two days (Bureau of Land Management, 1974). The 1981 annual wind rose for the Clovis Point mine (adjacent to the proposed East Gillette Federal minesite) is presented in figure III-1. Data recovery for the wind rose was 90.5 percent. Approximately 50 percent of the wind originates from the west to north-northwest sectors and south to south-southeast sectors at the minesite. The prevailing wind direction around the minesite was from the south-southeast during 1981. The onsite meteorological station reports wind data from an elevation of 10 meters above ground level and is located in sec. 9, T. 50 N., R. 71 W.

B. AIR QUALITY

Ambient air-quality data monitored in the vicinity of the East Gillette Federal minesite from 1979 to 1982 indicate that the State of Wyoming annual total suspended particulate (TSP) standard of 60 micrograms per cubic meter

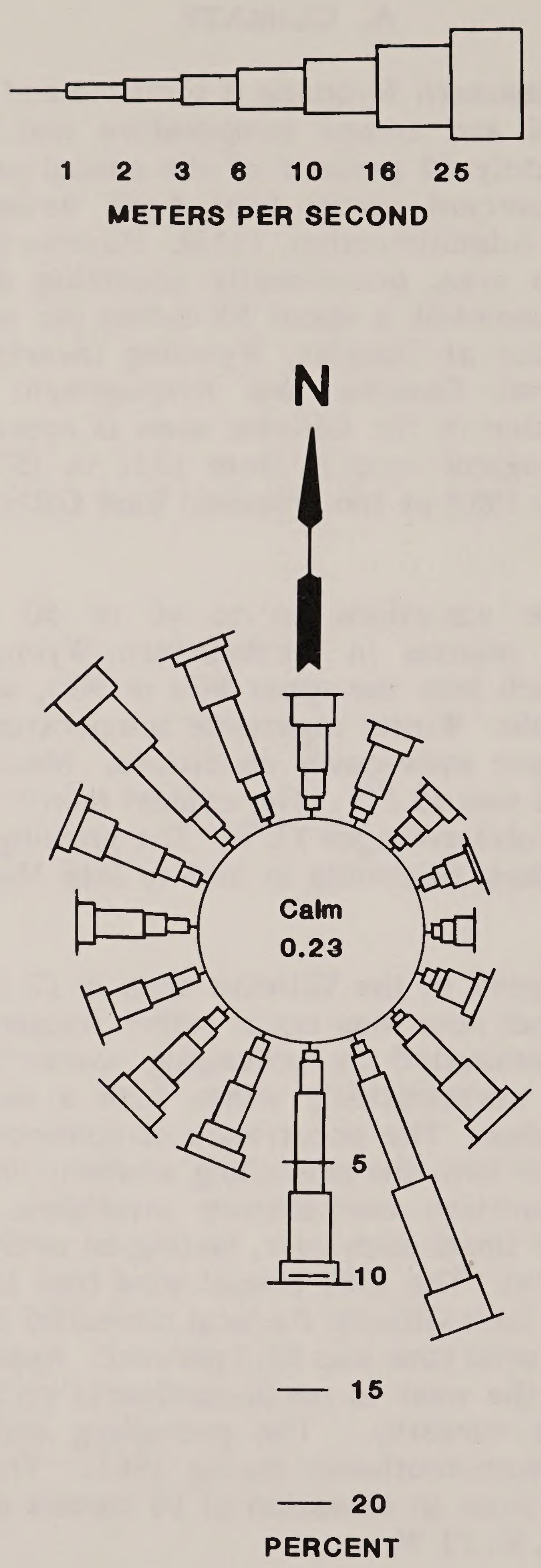

Figure III-1.--1981 wind-rose plot for the Clovis Point mine.

($\mu g/m^3$) has been met at all three monitoring sites. The 24-hour standard of 150 $\mu g/m^3$ has been exceeded more than the allowable one time per year at each site during 1979 (site 1), 1980 (site 3), and 1981 (sites 1 and 2). In 1982, the air quality at the proposed minesite improved markedly, with the 24-hour TSP standard being met at all three monitors at all times. Table III-1 gives particulate data for the East Gillette Federal minesite from 1979 to 1982. The three particulate monitors are located in sec. 9 (site 1), sec. 15 (site 2), and sec. 21 (site 3), T. 50 N., R. 71 W.

No gaseous monitoring data exist for the proposed facility; however, the State of Wyoming operates SO_2 and NO_2 monitors (gas bubblers) in Gillette. Between 1980 and 1982, the annual and maximum 24-hour averages of SO_2 were below 1 and 3 percent of the Wyoming standard, respectively. The annual average NO_2 from 1980 to 1982 was less than 13 percent of the Wyoming standard. The data from these monitors indicate that both SO_2 and NO_2 ambient concentrations are low (Wyoming Department of Environmental Quality, Air Quality Division, 1980, 1981, 1982).

Windblown dust is a natural phenomenon in the Gillette area and is most likely the cause of past and present excursions above the 24-hour particulate standards at the proposed minesite. Present air quality at the minesite is good, but will decline with the development of, and increased production from, surface mining and industrial operations in the Gillette area.

C. TOPOGRAPHY

The elevation of the permit area ranges from a minimum of 4,355 feet above sea level to a maximum of 4,631 feet, with an average of 4,487 feet. Most of the permit area is between 4,425 to 4,550 feet above sea level. The maximum relief is approximately 280 feet. The maximum average hill slope is approximately 24 percent (13.5°), with an average slope over the permit area of 6 percent (3.4°).

Approximately 65 percent of the proposed East Gillette Federal minesite consists of rolling hills, 32 percent of rough, broken land, and 3 percent of intermittent lakes and livestock impoundments. Beds of shale, siltstone, and poorly consolidated sandstone easily erode to form lower topographic terrain, whereas beds of scoria and consolidated sandstone are more resistant and form ridges and knobs. However, the large depressions generally occur over areas of scoria.

D. GEOLOGY

The permit area is located in the Powder River Basin and is underlain primarily by the Wasatch Formation of Eocene age. The proposed minesite is located immediately west of the surface contact between the Wasatch and the underlying Fort Union Formation of Paleocene age. The Wasatch is composed of yellowish-gray fine-grained to conglomeratic arkosic sandstone, interbedded with siltstones, carbonaceous shales, gray claystones and shales, and numerous coal beds.

The Wyodak coal bed, which is proposed to be mined at the East Gillette Federal mine, is at the top of the Fort Union Formation, just beneath the Wasatch Formation. The coal is divided into an upper and lower unit by up to 9 feet of interfingering shale splits or partings. Total thickness of the Wyodak coal on the

Table III-1.--TSP data for the proposed East Gillette Federal mine area[1]

(Source: Bob Schick, Wyoming Department of Environmental Quality, Air Quality Division, oral communication, December 8-9, 1983. Data are in $\mu g/m^3$)

Site No.	Year	No. valid samples	Annual geometric mean	Maximum 24-hour value	Second maximum 24-hour value
1	1979	55	43	172	159
1	1980	39	33	91	89
1	1981	42	35	174	162
1	1982	52	29	247	127
2	1979	48	31	93	69
2	1980	39	30	101	93
2	1981	48	35	250	206
2	1982	46	16	152	133
3	1979	53	32	115	85
3	1980	34	34	165	155
3	1981	51	37	168	126
3	1982	55	22	98	92

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[1] Wyoming air-quality standards: annual standard for particulates is 60 $\mu g/m^3$ (geometric mean); 24-hour standard for particulates is 150 $\mu g/m^3$ (not to be exceeded more than once per year); annual standard for SO_2 is 60 $\mu g/m^3$ (arithmetic mean); 24-hour standard for SO_2 is 260 $\mu g/m^3$ (not to be exceeded more than once per year); and annual standard for NO_2 is 100 $\mu g/m^3$ (arithmetic mean).

permit area averages 81 feet and ranges from 0 to more than 90 feet (figs. III-2 to III-5). In some areas where the coal has been exposed at the surface, such as in the central part of the permit area, the Wyodak coal beds have burned either partially or completely. The heat released has baked the overlying overburden into a highly oxidized, fused rock called scoria or porcellanite. Because of the presence of colluvium and scoria, coal outcrops are sparse. Regional dips are between 1 and 3° west toward the axis of the basin.

Approximately 287 million tons of in-place reserves exist within the permit area, of which 256 million tons (90 percent) will be mined. This represents approximately 0.02 percent of the estimated 1.3 trillion tons of reserves in the Powder River Basin (Choate and Johnson, 1981) and 1.2 percent of the 21.2 billion tons of the strippable reserves calculated by Glass (1975) to exist in the eastern Powder River Basin. For each acre of land mined at the East Gillette Federal mine, approximately 126,000 tons of coal would be recovered. The 256 million tons of coal that would be mined would supply the energy equivalent of nearly 700 million barrels of oil or more than 4 trillion cubic feet of natural gas.

The Ditto Lake fault crosses the permit area from the southwest to the northeast corners of sec. 29 and into the southeast corner of sec. 20. This small inactive fault and its two smaller associated faults have a maximum displacement of 100 feet.

The overburden is prodominantly sandstone, shale, carbonaceous shale, and mudstone. The overburden to be stripped ranges from 40 to 260 feet in thickness with an average 149-foot thickness (fig. A-3). As part of the exploratory drilling program, the applicant obtained cores of the overburden from eight holes drilled in 1974, eight holes drilled in 1978, and seven holes drilled in 1979. Cores from 16 of these holes (locations shown in fig. A-3) were analyzed for electrical conductivity (EC), sodium adsorption ratio (SAR), pH, texture, organic content, nutrients, major ions, and selected minor ions, such as boron, selenium, and lead. These analyses show that, with few exceptions, the upper 50 feet or more of the overburden is suitable for subsoil. Most of the poorer materials or those potentially toxic to vegetation occur at greater depths. No problems were noted in relation to salinity or alkalinity, and no high values of nitrate-nitrogen, selenium, or boron were reported. Acid-base potential was poor for some material in eight drill holes, but generally at depths greater than 188 feet, and will not affect use of the upper material as subsoil. No rare or unusual fossils have been found in the area.

The applicant has committed both to drilling and analyzing additional core holes, to bring the density of drill holes to one per 40 acres, and to monitoring highwalls to identify coal stringers and other toxic materials, which would then be buried under at least 8 feet of nontoxic and noncombustible material.

E. SOILS

Soils on the moderately to steeply sloping landscape of the permit area have developed under comparatively dense stands of short and midgrass vegetation common in the Powder River Basin. Because of the climate, the soils are low in organic matter; hence, they are predominantly light-colored, particularly on the ridge tops, and are shallow and high in lime. However, downslope soils often receive more moisture and are deeper, more clayey, and higher in organic matter. Outcrops of sandstone or shale are common.

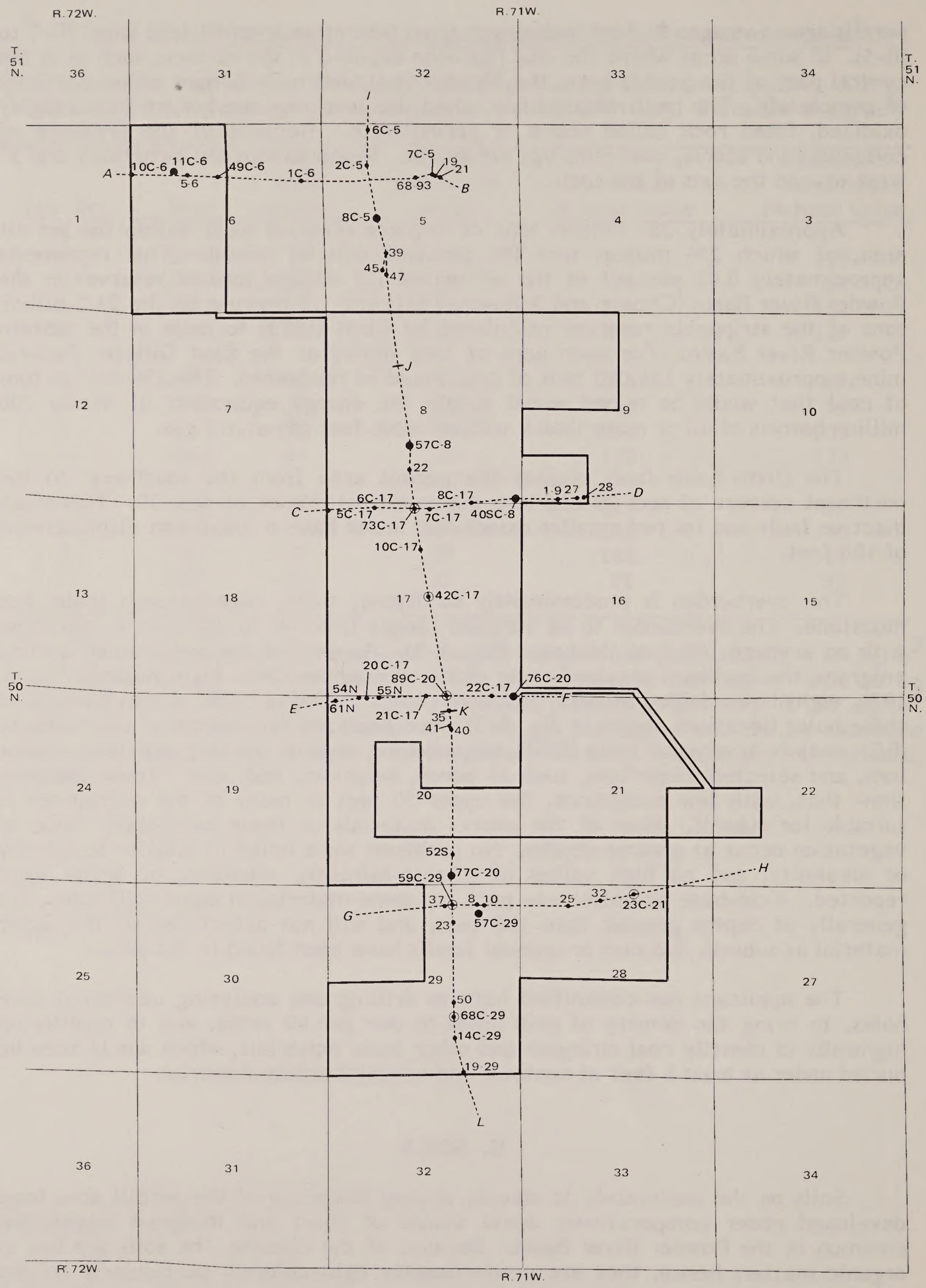

Figure III-2.--Location of cross sections in figures III-3 through III-5. (Furnished by applicant.)

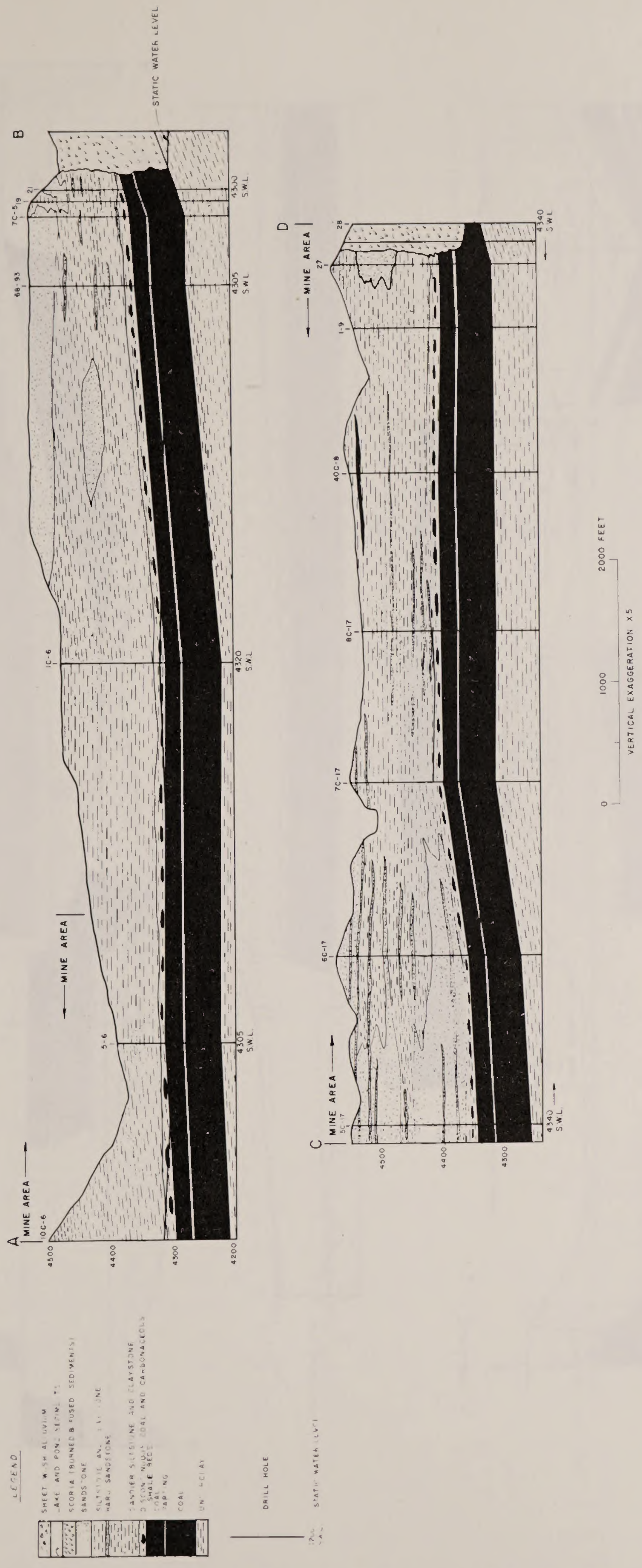

Figure III-3.--Cross sections A-B and C-D viewed from the south. See figure III-2 for locations. (Furnished by applicant.)

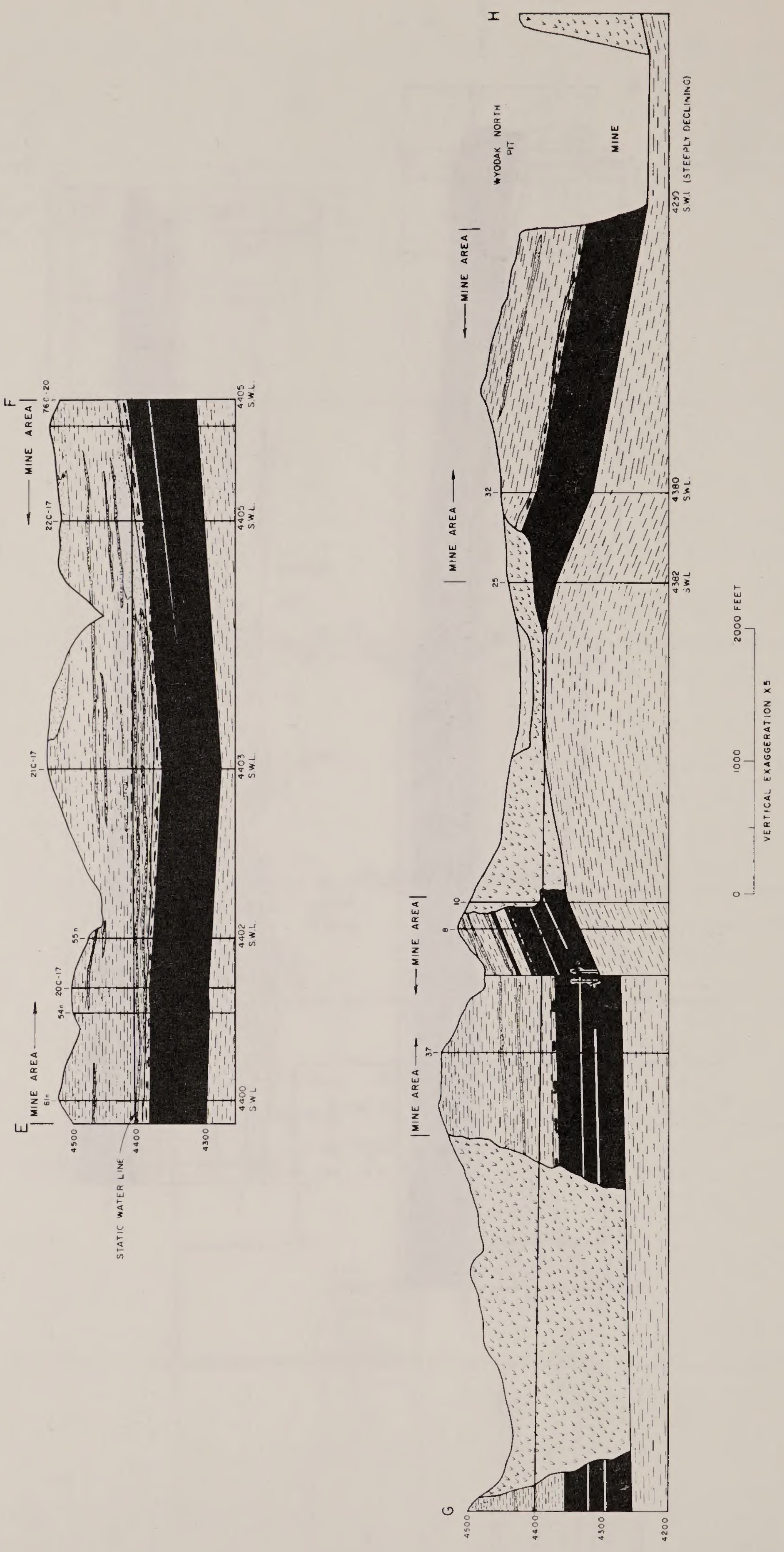

Figure III-4.--Cross sections E-F and G-H viewed from the south. See figure III-2 for locations. (Furnished by applicant.)

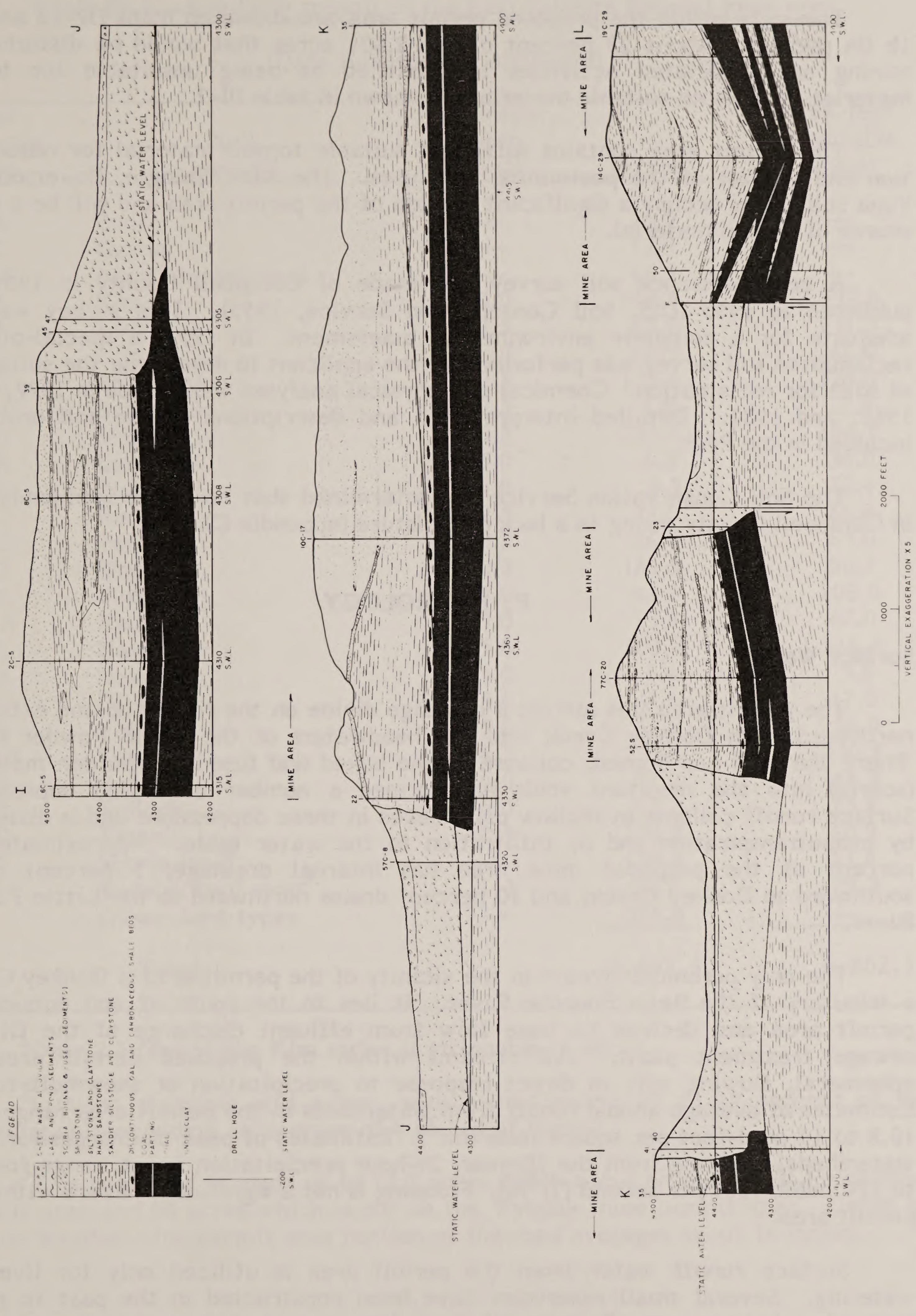

Figure III-5.--Cross sections I-J, J-K, and K-L viewed from the west. See figure III-2 for locations. (Furnished by applicant.)

The soils within the proposed permit area are shown on maps D7-1a and D7-1b (in pocket). About 23 percent of the 2,604 acres that would be disturbed by mining and associated activities is classified as being unsuitable for topsoil material. Soils with suitable material are shown in table III-2.

The permit area contains sufficient suitable topsoil material for redistribution and support of the postmining land uses. The Kim, Shingle, Haverson, and Vona soil series occupy a significant portion of the permit area and will be a major source of topsoil material.

A reconnaissance soil survey was made of Campbell County in 1939 and published in 1955 (U.S. Soil Conservation Service, 1955). This survey was not adequate for a complete environmental assessment. In 1975, a special-purpose reclamation soil survey was performed by the applicant to determine the suitability of soils for reclamation. Chemical and physical analyses were made in 1977, 1979, 1980, and 1981. Detailed interpretation and descriptions of the soil units are included in the PAP.

The Soil Conservation Service has determined that no prime farmlands exist in Campbell County owing to a lack of moisture (appendix C).

F. HYDROLOGY

Surface Water

The permit area lies astride a drainage divide on the rolling upland extending northward from Donkey Creek into the headwaters of the Little Powder River. Where the coal has burned, collapse of the baked and fused overburden materials (scoria) into the resultant voids has formed a number of closed depressions. Surface runoff collects in shallow playa lakes in these depressions and is dissipated by evapotranspiration and by infiltration to the water table. Approximately 85 percent of the proposed mine area has internal drainage; 5 percent drains southward to Donkey Creek; and 10 percent drains northward to the Little Powder River.

The only perennial stream in the vicinity of the permit area is Donkey Creek, a tributary of the Belle Fourche River. It lies to the south of and outside the permit area and derives its base flow from effluent discharge of the Gillette sewage treatment plant. All streams within the proposed permit area are ephemeral, flowing only in direct response to precipitation or snowmelt runoff. Estimates of average annual runoff from watersheds in the permit area range from 10.8 to 15 acre-feet per square mile (mi^2). Estimates of peak discharges for these watersheds, resulting from the 10-year, 24-hour precipitation event, range form 71 to 124 cubic feet per second (ft^3/s). Flooding is not a significant hazard within the permit area.

Surface runoff water from the permit area is utilized only for livestock watering. Several small reservoirs have been constructed in the past to retain water for this purpose. Because of the infrequency and short duration of runoff events, the applicant has not succeeded in obtaining samples for determination of the quality of the runoff; however, samples from four of the reservoirs indicate the approximate quality of the runoff water. The highest total dissolved solids (TDS) concentration found in these samples was 8,140 milligrams per liter (mg/L),

Table III-2.--Available topsoil on the East Gillette Federal mine area

(Data furnished by applicant)

Soil mapping unit	Soil series	Average depth (feet)	Acres	Acre-feet of suitable topsoil
1A	Bone	---	28.2	---
1C	Gaynor	---	12.1	---
1LA	Aeric Haplaquepts	---	46.1	---
3A	Kim	5.0	446.4	2,232.0
3A	Kim[1]	2.5	60.6	151.5
3B	Ulm	4.0	66.5	266.0
3C	Briggsdale	2.5	129.6	324.0
3RC	Briggsdale	2.5	1.0	2.5
3D	Shingle	0.5	213.4	106.7
4A	Limon	5.0	6.8	34.0
4B	Bidman	4.0	5.5	22.4
4C	Renohill	2.5	32.0	80.8
5C	Terry	2.5	26.0	65.0
5D	Shake	0.5	161.4	80.7
6A	Vonson	5.0	41.2	206.0
66A	Rauzi	5.0	13.4	67.0
7A	Haverson	5.0	303.8	1,518.5
7B	Haverson	4.0	1.4	5.6
7PA	Dillingson	5.0	3.4	17.0
8A	Vona	5.0	51.2	256.0
8AB	Vona	4.5	233.6	1,050.8
8B	Vona	4.0	47.2	188.8
8C	Tullock	1.5	17.2	25.8
8D	Tassell	0.5	121.8	60.9
P	Scoria land[2]	---	134.8	11.4
	Wyodak haul road[3]	1.3	22.7	29.5
	Other land types	---	376.6	---
	Total		2,603.5	6,802.1

[1] Only 2.5 feet of the Kim series is strippable in sec. 6.

[2] Limited stripping will occur, with an estimated 20 to 25 percent of the mapping unit providing an average of 4 inches of topsoil.

[3] This haul road is made up of 12.7 acres which occur on the Clovis Point mine permit area and 10 acres which occur on the Wyodak mine permit area. Depth of soil on Wyodak mine permit area portion of the road averages about 16 inches.

but the TDS concentration of most of the samples was less than 1,000 mg/L. Water of this quality is adequate for livestock use. Samples of water from Ditto Lake show TDS concentrations of about 8,000 mg/L. Water of this quality is generally unusable without treatment. With time, the chemical make-up of the ponded water may change.

No alluvial valley floors are present in the permit area. The stream channels are narrow and sediments outside the immediate channel generally are colluvial or lacustrine deposits. No evidence of subirrigation occurs along these channels and the drainage areas are too small to provide sufficient runoff for flood irrigation. The only areas where crops have been grown in the past several years are areas of dryland farming near one or two of the playas.

Erosion and sedimentation on the permit area are minimal. The area as a whole is stable, although some minor headcutting and rilling occurs locally on the steeper slopes. Annual sediment yield was estimated to range from 0.1 to 0.3 acre-feet per mi^2, using the Pacific Southwest Interagency Committee method (1968). This is a qualitative estimating method, in which mine erosion-related watershed factors are given numerical ratings according to a prescribed range of values. An empirical relationship converts the sum of these values to sediment yield. Sediment yield is least from areas underlain by scoria and greatest on shale outcrops. Most of the sediment derived from erosion is deposited in the playas that bottom the closed depressions. Annual sediment yield to streams outside the permit area is estimated to be about 0.17 acre-feet per year.

Ground Water

Within and adjacent to the permit area, ground water occurs in the alluvium, the scoria, the overburden, the coal, the underburden, and at depth within the Fort Union and other formations. The more significant aquifers are found in the scoria, the overburden, the coal, and the Fort Union.

Alluvium is found on valley floors and along the small tributary channels. The thickest accumulations of alluvium are found along Donkey Creek, which lies outside the permit area. Within the permit area, alluvial deposits are of limited depth and lateral extent and produce only small amounts of water.

The Wasatch Formation forms the overburden in the permit area. It consists mainly of shales and interbedded lenticular sandstones. The shales have limited permeability and retard percolation to the underlying coal. The sandstone lenses, which are the principal saturated zones, are thin, of limited areal extent, and generally not interconnected. Therefore, areal movement of water through the overburden is minimal. Though some water is obtained from the sandstones, they are generally not considered reliable sources.

The scoria, which may be considered as a unit of the Wasatch Formation, consists of baked and fused Wasatch sediments. Regionally, the scoria deposits occur along the coal outcrop. Where sufficiently fractured, the scoria can hold significant amounts of water; it acts as a recharge area for the coal aquifer and for the overburden where the two are in contact. There is very little surface runoff from areas underlain by scoria. The saturated thickness of the scoria varies considerably over the permit area and plays a significant role in determining ground-water circulation patterns in the area.

The Wyodak coal bed is confined between the shales of the overlying Wasatch and a thick shale sequence directly below the coal. It is considered as the upper unit of the Fort Union Formation and averages 80 to 90 feet thick in the permit area. It is the most important of the near-surface aquifers and owes its water-holding capacity to the degree of fracturing. This capacity is generally sufficient to supply water for domestic use and livestock.

The Fort Union Formation consists of over 2,000 feet of interbedded clays, sandstones, shales, and beds of subbituminous coal. In general, the formation has poor aquifer characteristics, but some of the sandstone lenses are extensive enough to yield adequate quantities of water for livestock and domestic use. Also, thick sequences of sandstone occur at depths of about 1,000 feet or more in the Tullock Member of the Fort Union Formation. These deep sandstones supply mines in the area with potable water.

Regionally, water moves through the coal and overburden aquifers from north to south. Within the permit area, the direction of ground-water circulation is influenced by topography and the occurrence of scoria deposits. The applicant's map of the premining potentiometric surface in the overburden (Wasatch) shows a ground-water high occurring across sec. 17, roughly corresponding to an east-west topographic ridge. South of the divide, the ground-water gradient is toward the Ditto Lake depression. North of the divide, the ground water moves north-northeast to the scoria deposit underlying Springen Hollow.

Locally, water movement in the coal is affected by the scoria. Water in the coal aquifer generally moves from the southwest part of the permit area through the Ditto Lake scoria southeastward to the Wyodak mine pit and northeasterly toward the Springen Hollow scoria. However, the static water levels shown in figure III-5 suggest that a ground-water divide may also develop in the coal aquifer between Ditto Lake and Springen Hollow, depending on the level of saturation in the Ditto Lake scoria. If the saturation level is low, this divide will form and water in the coal will move toward both depressions. If the saturation level is high, movement will be from Ditto Lake to Springen Hollow.

Normally, only the base of the scoria deposit in Springen Hollow is saturated, indicating that the discharge from this deposit is in equilibrium with its recharge. This scoria deposit extends several miles to the north of the permit area and probably discharges at Moyer Springs, located in the NW¼ sec. 30, T. 51 N., R. 71 W. The scoria in the Ditto Lake depression remains saturated to approximately the level of the depression floor, apparently because recharge to the scoria exceeds discharge to the Wyodak mine and to the surrounding coal.

Water from shallow aquifers in the area (Wasatch, scoria, and coal) varies in quality, but, measured by Wyoming water-quality criteria, is suitable only for livestock and wildlife consumption. The range of TDS concentrations measured in water samples taken from these aquifers in the vicinity of the proposed mine is given in table III-3. Other constituents that commonly exceed the various criteria are iron, sulphates, and nitrogen. Values of pH commonly range from 7.2 to 8.1. Water from the Fort Union below the Wyodak coal is generally of better quality than that from the shallow aquifers. A well on the adjoining Clovis Point mine obtains water that meets U.S. Environmental Protection Agency drinking-water standards from several sand lenses at depths of 625 to 1,200 feet. Low yield rather than poor quality is the reason that ground water is rarely used for irrigation in the area.

Table III-3.--Concentrations of total dissolved solids in ground waters

Aquifer	Range of concentrations (mg/L)	Type of water
Wasatch (including scoria)	1,100 - 3,600	calcium magnesium sulfate
Wyodak coal	800 - 3,800	sodium sulfate bicarbonate
Lower Fort Union	275 - 1,500	sodium calcium bicarbonate sulfate

The applicant indicates that 177 permitted water wells are located within the 5-foot drawdown area resulting from mining operations on the Clovis Point, East Gillette Federal, Fort Union, and Wyodak permit areas; its boundary coincides on the east and north with the drawdown contour shown in figure IV-6, and lies outside that contour by 1 to 2 miles to the west and 2 to 3 miles to the south and southeast. It is not known if all 177 of these wells are operational. Many of the wells are located between the permit area and the east edge of the City of Gillette, and most are completed in the Wasatch and Fort Union Formations. Ninety of these wells are owned by mining companies and the rest are owned by other private interests. Most of the company-owned wells are used for ground-water monitoring and will probably be mined through. The stated uses of the other 87 wells are: stock watering (31), domestic (25), irrigation (3), industrial (3), recreational (1), and miscellaneous (24). There are also eight small reservoirs within the permit area used for stock watering.

Water Rights

The applicant lists 446 water rights on record with the Wyoming State Engineer's Office for the area within 3 miles of the permit area. Of these, 361 are ground-water rights and 65 are surface-water rights. One hundred twenty-three of the ground-water rights and 17 of the surface-water rights are on or within ½ mile of the permit area. Of these 123 ground-water rights, 67 are observation wells installed for the applicant and other mines with no water appropriated, 15 are stock wells, 10 are stock and domestic wells, and 31 are wells for industrial uses, such as mine-related activities or powerplant use. These last 56 wells yield a total of 8,247 gallons per minute (gal/min) of water, of which 7,915 gal/min are supplied by the industrial-use wells.

The 17 surface-water rights on or within ½ mile of the permit area are for 12 reservoirs, with a total capacity of 360.25 acre-feet, and 5 diversions, with total capacities of 5.34 ft^3/s. The surface-water rights were allocated primarily for livestock and irrigation use. The applicant has committed to replace any water source interrupted, discontinued, or precluded, owing to mining at the East Gillette Federal mine, with water of equivalent quantity and quality.

G. VEGETATION

The native grassland vegetation on the minesite is typical of the shortgrass prairie which develops under the semiarid climate, topography, and soil conditions of the region. Comingled with the native grasslands are big sagebrush and silver sagebrush stands and crested wheatgrass pastures resulting in a shrub-grassland community used for livestock grazing and wildlife habitat.

Six vegetation types exist within the 3,246-acre permit area (maps D8-1a and D8-1b, in pocket). Approximately 2,604 acres of the permit area would be disturbed by mining activities. Of this, 1,015 acres are big sagebrush, 661 acres are crested wheatgrass, 510 acres are silver sagebrush, 298 acres are upland grassland, 72 acres are bottomland grassland, and 34 acres are cultivated land. Information on cover and production is summarized in table III-4.

Control areas were established for each native vegetation type on sites outside the area to be affected by mining activities. These sites will be used for

Table III-4.--Vegetation types on the East Gillette Federal minesite

Vegetation type	Acres disturbed	Percent of disturbed acreage	Percent ground cover	Productivity (lbs/acre)
Big sagebrush	1,015	39	39.1	1,916
Crested wheatgrass	661	25	31.9	2,307
Silver sagebrush	510	20	43.6	1,931
Upland grassland	298	11	32.1	1,048
Bottomland grassland	72	3	63.8	2,613
Cultivated (small grain)	34	1	---	---
Roads, ponds, etc.	14	less than 1	---	---
Total acres disturbed	2,604	100		

cover and production comparisons to account for precipitation effects when bond release is anticipated.

No commercial stands of timber occur on the permit area. However, numerous trees are growing adjacent to an abandoned ranchsite and in a wind break, both of which would be affected by mining activities. Plains cottonwood, willow, and Chinese elm are most abundant.

No rare or endangered plants were noted within the permit area. Six noxious weeds occur in limited (insignificant) amounts and one selenium indicator species (twogroove milkvetch) was noted. Several important winter browse species (winterfat, currant, big sagebrush) occur on the permit area.

H. WILDLIFE

Kerr-McGee collected wildlife data for the East Gillette Federal mine and adjacent areas in 1981. The data-collection program was approved by the Wyoming Game and Fish Department (GFD) and the four seasonal inventories were done in accordance with Wyoming DEQ guidelines.

Seven wildlife habitats occur on the permit area. Mixed sagebrush, crested wheatgrass, and upland grassland habitats cover 94 percent of the permit area. Although the playa, bottomland grass, riparian, and rock outcrop habitats constitute a total of only 6 percent of the permit area, they offer important food and cover values to wildlife. These various habitats and their interspersion explain the observations of 76 bird, 22 mammal, 8 herptile, and 2 fish species in the area. Additional details on these species and special uses of the area's habitats are presented below.

Large Mammals

Pronghorn, mule deer, and a single white-tailed deer were observed in the East Gillette Federal mine area, with pronghorn by far the most abundant. A maximum of 29 mule deer were observed in the area with the riparian and bottomland grass habitat being preferred by this species. There are no unique or crucial habitats for mule deer on the project site.

Pronghorn preferred the mixed sagebrush habitat most of the year and a high count of 468 pronghorn was recorded in the area. The largest numbers of pronghorn were observed in late summer and fall. There are no crucial or special habitats for pronghorn on the East Gillette Federal mine permit area.

Small Mammals

The deer mouse was most frequently captured during small mammal trapping and a total of six species was caught. Several habitats supported similar diversities, but abundance was higher in the riparian and rock outcrop habitats. Intensive searches failed to document any prairie dog colonies, a major prey source for the endangered black-footed ferret.

Other Mammals

Jackrabbits, cottontails, red foxes, coyotes, skunks, bobcats, raccoons, badgers, and long-tailed weasels were documented users of the East Gillette Federal mine area. The wide-ranging species of this group use several habitats for food and cover, but some were closely associated with single habitats. The raccoon and striped skunk were associated with riparian and bottomland habitat.

Raptors

Ten raptor species were observed in the area and confirmed nesters included the ferruginous hawk, the golden eagle, the Swainson's hawk, the red-tailed hawk, and the great horned owl. Golden eagles receive special protection under the Bald Eagle Protection Act and the ferriginous hawk is a migratory bird of great Federal interest for the U.S. Fish and Wildlife Service.

Game Birds

The ring-necked pheasant, sage grouse, mourning dove, Hungarian partridge, and ten waterfowl species were observed. Sage grouse leks were not found and the upland game bird use of the site is low. Most waterfowl observations were of migrants during the spring and fall and were associated with reservoirs and stockponds. Only the mallard is recorded as a breeder in the study area.

Other Birds

Numerous songbirds and some shorebirds were observed in the project area, utilizing a variety of habitats. The riparian and bottomland grass habitat supported the highest species diversity; crested wheatgrass supported the least.

Herptofauna

Although trapping for these species was unsuccessful, 19 species of reptiles and amphibians are expected to inhabit the area. Mixed sagebrush and rocky outcrop serve as important habitats for reptiles. The riparian zones are beneficial for amphibians as well.

Fish

Impoundments in the area provide marginal habitat for fish; only one reservoir contained fish--the fathead minnow.

Threatened and Endangered Species

The peregrine falcon, the bald eagle, and the black-footed ferret are the listed species which may occur in the area. Peregrines would certainly be migrants, whereas the ferret would likely be associated with prairie dog colonies. The bald eagle has been infrequently observed during the winter and there are no winter roosts or concentration areas near the site. The closest bald eagle nest is near Sheridan, over 60 miles away.

I. LAND USE

Ownership of the surface of the permit area is given in table III-5 and shown on figure III-6. The use of the land is summarized in table III-6.

There is no Federal surface within the permit area. Corporate- and State-owned surface is currently being leased for agriculture and grazing. The privately controlled surface is being used for homesites, livestock grazing, agricultural production, mineral (scoria) sale, and roads. Although the predominant land use is grazing, there is appreciable use by wildlife, as discussed in the "Wildlife" section of this chapter. There are ten privately owned water wells, eight livestock watering impoundments, five dry or abandoned oil or gas wells, two inactive gas wells, one producing gas well, and about 10 miles of fence on the permit area.

The Fox Park and Collins Heights subdivisions are located adjacent to the permit area.

J. TRANSPORTATION

About 3/4 mile of U.S. 14/16 crosses the southern part of the permit area in sec. 29. Interstate 90, which carries east-west through traffic in the region, crosses about 0.5 miles of the area in secs. 20, 21, and 22. The haul road proposed to connect mining in sec. 6 with sec. 8 would cross Garner Lake Road. The access road to Kerr-McGee's adjacent Clovis Point mine crosses the permit area in secs. 8 and 9. Access roads to Ditto Lake cross the permit area in sec. 20. A few minor unimproved roads also cross the permit area. Most of these connect to oil or gas wells in the Springen Ranch field or to livestock watering sites.

About 1 mile of the main line of the Burlington Northern Railroad, extending from Alliance, Nebraska, to Billings, Montana, crosses the southern part of the permit area parallel to U.S. 14/16. An average of 10.5 trains a day passed through Gillette in 1978 (Bureau of Land Management, 1979a). This is about 50 percent of capacity. Regional development of coal mining is expected to cause a major increase in rail traffic east and south of Gillette, but not through Gillette.

Gillette is served by the Campbell County Airport, about 5 miles northwest of the city. At present, the airport is the second busiest airport in the State of Wyoming. A comprehensive plan for the airport was approved by the Federal Aviation Administration in 1979. This plan called for paving the cross-wind runway, extending the main runway to accommodate planes of the Boeing-737 class (60,000 pounds), constructing a complete taxiway system and more apron area, and installing navigation aids. All the improvements and modifications to the airport were completed as planned in June 1983.

About 3 miles of power-transmission lines cross the permit area. The only power-generating plant in the area is the Wyodak plant, which consists of a 330-megawatt generating unit. Coal for this plant comes from the nearby Wyodak mine. Based on Rural Electric Association projections, most of the electricity generated at the plant will be consumed locally if coal mining and related industries expand to anticipated levels.

Table III-5.--Surface ownership and acreage at the East Gillette Federal mine

Owner	Acres	Percent of leasehold
Kerr-McGee	2,453	75
Wyodak	218	7
State of Wyoming	485	15
Private	90	3
Total	3,246	100

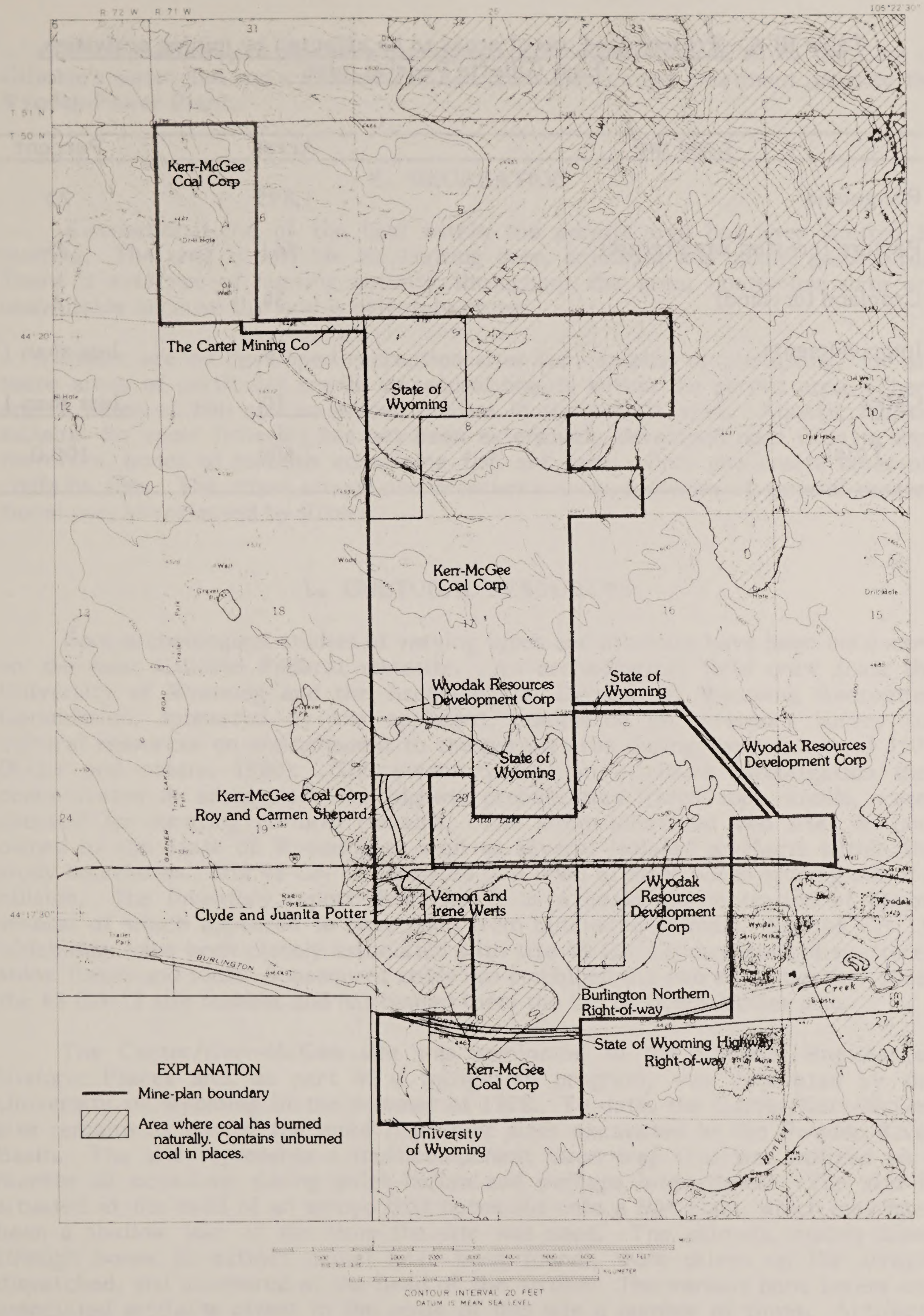

Figure III-6.--Surface ownership at the East Gillette Federal mine. (Data furnished by applicant.)

Table III-6.--Present land use of areas to be affected by mining activities, East Gillette Federal mine

Land use	Acres	Percent
Rangeland	1,895	73
Pasture (crested wheatgrass)	661	25
Cropland (dryland)	34	1
Impoundments	6	less than 1
Other	10	less than 1
Total	2,604	100.0

Three natural-gas pipelines cross parts of the permit area as do the City of Gillette's water line and a wastewater line from the sewage treatment plant to the Wyodak Power Plant.

K. RECREATION

Recreational use of the land within the permit area has been limited to hunting. The area is suitable for hunting deer, antelope, and upland game birds. There is evidence of hunting activity throughout the area; hunter-use data are unavailable because the land is privately owned.

There are no developed recreation sites for camping or picnicking, nor are there areas of particular scenic or natural beauty within the permit area. There are 18 acres of fish and waterfowl habitat in the permit area. Aquatic habitat suitable for sport fisheries has not been extensively developed near Gillette and, therefore, ponds or streams containing fish are rare. Only one onsite reservoir contains fish. The areas around the reservoirs show evidence of general recreational use, as reflected by litter.

L. CULTURAL RESOURCES

Four archeological studies of varying types and intensity have been conducted on the East Gillette Federal minesite. An archeological field crew from the University of Wyoming and the Archeological Division of Wyoming Recreation Commission, sponsored by the applicant, completed an inventory survey for cultural resources on and adjacent to the permit area during the summer of 1975 (Reiss and others, 1980). The inventory was an intensive investigation that concentrated in areas with the highest probabilities (ridge tops, knolls, water courses) for locating cultural remains. The study identified two sites on land owned by the State of Wyoming as well as several isolated artifacts within the study boundaries. Site 48 CA 12 consisted of a level of bison bones eroding out of a hillside. The inventory report describes it as a heavy concentration of bones, several of which appeared to have been from butchered animals. Site 48 CA 13, which may have been closely associated with site 48 CA 12, consisted of scattered stone flakes and tools. Subsequent study has combined the two sites together under the 48 CA 12 site number and has named them the Carter/Kerr-McGee site.

The Carter/Kerr-McGee site was nominated to the National Register of Historic Places and, as part of a mitigation program, was excavated by the University of Wyoming in the summer of 1978. To date, the Carter/Kerr-McGee site remains as one of the more important sites excavated in the Powder River Basin. The site represents a multicomponent bison trap that was utilized on a number of occasions during paleo-Indian and perhaps later times. The site is situated at the head of an arroyo that opens out onto a flat plain, which may have been a shallow lake at the time the site was used. The animals, mainly bison (though bones of extinct camel have been found), were driven up the arroyo, dispatched, and butchered at the head of the arroyo. The various bone layers and associated artifacts attest to the reuse of this site a number of times. Artifacts indicate use at least during Clovis, Folsom, Agate Basin-Hell Cap, and Cody Complex times, dating from 11,000 to some 8,500 years ago. More recent artifacts, including a historic metal arrow point, have been found at the site; however, they were located in questionable contexts. Much of the site appears to have been lost through erosion prior to its discovery and the little portion that remained has been excavated. The publication of a final report on the Carter/Kerr-McGee site excavations, authored by George Frison, is expected in 1984 and is likely to cause a rethinking of the paleo-Indian period in northeast Wyoming.

In 1980, Gordon and Kranzush, Inc., under contract to OSM, surveyed five arbitrarily chosen tracts (780 acres) within the permit area. The survey was conducted as a check on the reliability of the earlier survey. The survey located 16 additional cultural resources, including three prehistoric sites, three localities (two historic, one prehistoric), and ten isolated finds (one historic, nine prehistoric). None of the localities or isolated finds was considered significant, while two of the three sites (48 CA 493, 494) were recommended as being potentially eligible for nomination to the National Register of Historic Places. Based on the results of their survey, coupled with environmental data, Gordon and Kranzuch indicated that, for the most part, the original survey was "of sufficient intensity to locate major or significant cultural resources" (Gordon and Kranzuch, Inc., 1980).

In 1981, based on recommendations by Gordon and Kranzuch, Archaeological Services tested sites 48 CA 493 and 48 CA 494 (Girouard and Jones, 1981). During the course of work, three other "sites" (48 CA 777, 778, and 779) were located in adjacent areas. As a result of review of the report by OSM and the Wyoming State Historic Preservation Office (SHPO), it was concluded that none of the sites, including 48 CA 493 and 48 CA 494, was eligible for nomination to the National Register; therefore, no further work was required at these sites. Wyoming SHPO records indicate that two sites, Donkey Town and the Peerless mine and associated townsite, are located in or near the permit area. Donkey Town was a tent city supporting the construction of the railway. The Peerless mine shaft was sealed in 1981 by OSM as part of its abandoned mine land program. The scanty and poorly preserved remains of the Peerless townsite are not considered historically significant.

M. VISUAL RESOURCES

A visual-resource classification was made by BLM from seven observation points on the Interstate 90 right-of-way through the permit area, from county roads, and from Gillette. This inventory used BLM visual-resource inventory and evaluation procedures, as explained in BLM Manual 6300 (Bureau of Land Management, 1975).

The landscape of the permit area is typical of the eastern Powder River Basin grasslands--an open country of rolling plains. BLM categorizes such landscape as scenic-quality class C, because it lacks variety in landform, color, and contrast throughout most of the year. The region has broad river courses, low hills, and scattered buttes. These features provide no water for a dominant scenery-evaluation factor, little variation in vegetation, and no unique factors. Major manmade intrusions into this setting are primarily related to ranching and to resource development (petroleum, coal, and power generation).

On the basis of the visual-sensitivity evaluation, the East Gillette Federal mine permit area falls into three visual-resource-management classes: Classes III, IV, and V. These management classes cover the permit and adjacent areas as depicted in figure III-7.

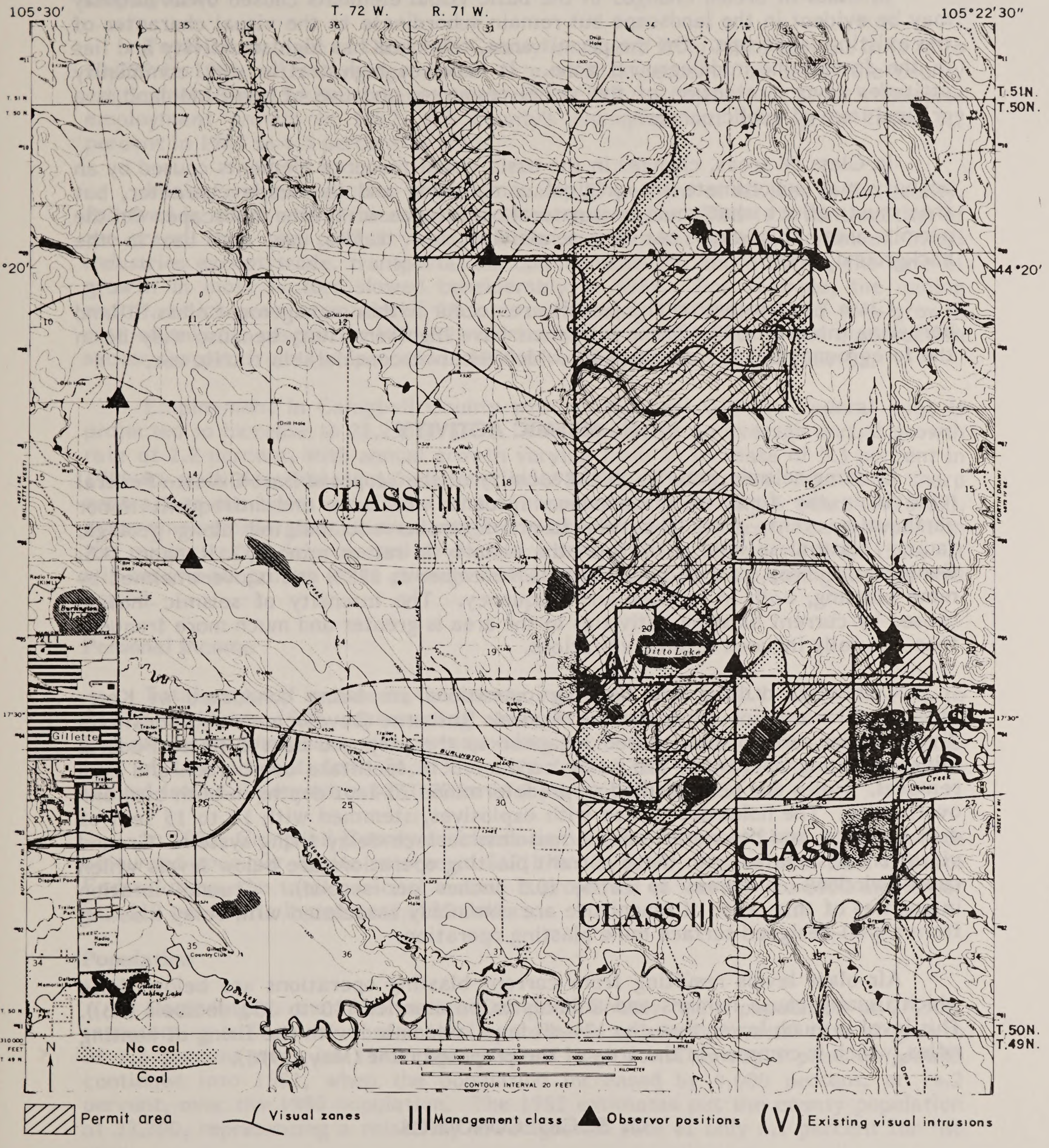

Figure III-7.--Visual-resources management classification of the East Gillette Federal mine permit area. (See figure III-6 for correct permit boundary.)

In Class III areas, changes in the basic visual elements caused by an activity may be evident in the landscape but remain subordinate to the visual character of the existing landscape. On the permit area, this class has high sensitivity and lies in the foreground-middleground zone. It receives high traffic use; community attitudes favor protection of the visual resource; and use of non-BLM land is a critical item of public concern.

In Class IV areas, changes in the basic visual-resource elements caused by an activity may subordinate the original composition and landscape character, but they must reflect what could be a natural occurrence within the landscape. On the permit area, this class has low sensitivity, low traffic use, and lies in the background zone.

Class V intrusions on the permit area occur within management class III land bordering Interstate 90. These intrusions have high sensitivity because they lie in the foreground next to Interstate 90, which receives considerable traffic use.

N. SEISMIC ACTIVITY

Existing seismic activity in the vicinity of the proposed East Gillette Federal mine is in the form of blast-induced ground vibrations and infrequent minor earthquake events from the relaxation of strains accumulated along geologic faults. Natural seismic activity in the vicinity is rather minor (G. Reagor, U.S. Geological Survey, oral communication, November 1, 1983) and is overwhelmed by mine blasting, both in number and frequency. The intensity of seismic motion caused by current blasting activities in the area is greater and much more frequent than naturally induced seismic vibrations.

Currently, drilling and blasting operations are being conducted at Kerr-McGee's Clovis Point mine and the Wyodak Resource Development Corporation's Wyodak mine, which are located adjacent to the proposed East Gillette Federal mine. Blasting operations are being conducted to facilitate overburden and coal removal. Holes are being drilled to predetermined 20-foot depths in both coal and overburden. The holes are loaded with explosives, stemmed with 10 to 15 feet of drill cuttings, and detonated using a noiseless surface-delay firing system. Ground vibrations associated with these current blasting operations are below levels which cause windows in homes to rattle (0.5 inches per second). Ground-vibration intensities of this order of magnitude are commonly associated with delay blasting from a well-designed surface mine blasting operation.

Air-blast levels resulting from current blasting operations are below those which usually cause humans and animals to be startled (80 to 100 decibels (dB)). This level is much lower than the 124-dB level associated with the firing of hunting rifles, which is common in the area of the proposed mine (May, 1978).

O. SOCIOECONOMICS

The sections on socioeconomics in this draft EIS are based on a report prepared by Tetra Tech, Inc. (1983). Copies of the report are available for inspection at OSM, Brooks Towers, 1020 -15th Street, Denver, Colorado, and at the Department of Planning and Development, Gillette, Wyoming.

Employment

Total labor force in Campbell County increased from 7,916 persons in 1976 to 20,296 in 1982, at an average annual rate of 17.1 percent. In 1982, the county employment was 19,474 workers compared to 1981 employment of 17,523. Despite employment growth in 1982, the county's unemployment rate grew from 3.2 percent in 1981 to 4.5 percent in 1982.

Mining and construction comprise nearly 55 percent of all jobs in the county, followed by trade and services with a 34-percent share. This is a continuation of the trend from the past 2 years. While employment growth continued in all industries except trade, transportation, communications, and utilities, the rate of growth in most sectors slowed considerably in 1982. For example, the mining sector, which grew at a rate of 23.5 percent during 1980-81, slowed to a growth rate of only 5.4 percent in 1981-82. Similarly, the growth rate in the construction sector dropped from 75.6 percent in 1980-81 to only 7.1 percent in 1981-82.

Employment in Campbell County without the East Gillette Federal mine is projected to increase to 22,250 in 1990. This represents an average annual growth rate of 2.2 percent, with annual growth varying from an increase of 5.3 percent in 1984-85 to a decrease of 1.0 percent in 1986-87. This growth rate is in sharp contrast to the boom conditions of the immediately preceding 6 years (1976-82), when employment grew at an average annual rate of 17 percent. Employment in the mining sector is projected to decline from 4,910 in 1982 to 4,700 in 1984; it will resume its growth at an average annual rate of 3.8 percent during the 1984-90 period.

Personal Income

Total personal income in the county increased from $120.4 million in 1976 to $355.8 million in 1981, representing an average annual increase of 24.2 percent. Per capita income during the corresponding period increased at an average annual rate of 11.6 percent, from $6,543 in 1976 to $11,331 in 1981. Annual increases ranged from 6.9 percent in 1977-78 to 16.3 percent in 1978-79.

In 1982, Campbell County residents earned an estimated $404 million, which amounted to a per capita income of $12,130. By 1990, without the East Gillette Federal mine, the total personal income is projected to increase to $552 million or $13,810 per capita in constant 1982 dollars.

Population

According to the 1980 census, Campbell County had a population of 27,500, representing an increase of almost 112 percent or an average annual rate of growth of 7.8 percent over its 1970 population of 12,957. This rapid pace of growth continued into 1981, when the population increased by 4,000 persons, or 14.2 percent, over the 1980 population. The 1982 estimates put the county population at 33,300, representing a relatively lower growth rate of only 6.1 percent for the year.

The City of Gillette, with an estimated population of 17,700 in 1982, accounted for 53.2 percent of the total county population. Almost 53 percent of the city's growth in 1981 and 1982 was attributable to annexations. Discounting the annexed areas, the city's population grew 8.4 percent in 1982, down from 11.1 percent the previous year.

The Gillette urban area encompasses the City of Gillette and all major residential subdivisions or commercial concentrations in close proximity to the city. It forms a unified housing market for the persons working in the nearby mines, as well as at the city and county offices and businesses of Gillette, and accounted for 25,400 or 76.3 percent of the total county population in 1982.

Population in Campbell County without the East Gillette Federal mine is projected to increase from 33,300 in 1982 to 38,400 in 1988, at an average annual rate of 2.4 percent. This rate, however, is not uniform through the years, as mining and construction activities show some peak periods up to 1986, when most of the proposed or planned construction will be completed. Assuming a growth rate of 2.0 percent for 1989 and 1990, the county is projected to attain a population of 40,000 by 1990.

Similarly, the population of Gillette during the 1982-90 period is projected to increase by 5,800, from 17,700 in 1982 to 23,500 in 1990.

The Gillette urban area is projected to absorb most of the population growth in the county. By 1990, about 30,700 persons are expected to reside in the Gillette urban area, up from 25,400 in 1982, and representing a 21 percent increase from 1982 to 1990. Currently, the Gillette urban area houses about 76 percent of the county's total population. This percentage is expected to remain relatively stable over the forecast period as coal mining employment grows in the southern part of the county.

Housing

Of the 12,116 housing units estimated for the entire county, permanent housing units account for 96 percent; the remaining 4 percent comprise transient units and group quarters. The largest proportion, almost 48 percent, of the permanent housing in the county consists of single-family homes, with mobile homes second at about 32 percent. Motel rooms and Pioneer Manor Nursing Home make up the bulk of transient units and group quarters in the county.

About 77 percent of the total county housing is located within the Gillette urban area, including 97 percent of the motels, 94 percent of the multifamily units, and 27 percent of the mobile homes. Single-family homes are concentrated in the Gillette urban area and the Town of Wright.

As of December 1982, 1,305 housing units were estimated to be available for purchase or rent in the county. About 76 percent of the total available units in the county were located within the Gillette urban area.

The county's housing stock is expected to expand by a total of 2,200 units for the period 1982-90, or an average of 275 units per year. Of the 2,200 additional units, 1,800 are projected to be located in the Gillette urban area. The growth rate, which is based on projections of housing demand without the East Gillette Federal mine, would peak in the mid-1980's owing to the continued expansion of mining and construction activities during this period. With demand slackening in 1986-87, a short-term surplus of housing could occur in 1987, but would be more than offset in the following years. The demand for new housing is expected to average about 225 units per year between 1982-90.

Law Enforcement

Unincorporated areas of Campbell County (4,700 mi^2) are under the jurisdiction of the 35 officers of the sheriff's department, which has its headquarters in the Campbell County Courthouse in Gillette. A total staff of 56 persons works in the courthouse and at a substation in Wright. The county jail, with space for 38 prisioners, is housed in the courthouse and, in 1982, had an average occupancy of over 100 percent. During peak periods, extra prisoners are housed in jails in other cities (e.g., Buffalo and Sheridan). The staff of the sheriff's department currently operates 19 vehicles.

A new jail facility, which will eventually house between 100 and 200 prisoners, depending upon its final configuration, is under contruction in Gillette. A portion of the new jail may be ready for use by late 1984.

The sheriff's department maintains a ratio of 1.0 full-time officer per 1,000 unincorporated residents, a number lower than the national average of 1.5 officers per 1,000 population. This ratio is considered adequate given the rural nature of Campbell County. The number of incidents, arrests, and percent of jail occupancy have all increased significantly in recent years. For example, the percent of jail occupancy increased from 60 percent in 1980 to 90 percent in 1981, and exceeded 100 percent in 1982.

The 52-person police force of the City of Gillette is headed by a chief, one lieutenant, and six sergeants. The force has 35 officers and maintains a ratio of almost 2.0 officers per 1,000 population. This ratio is somewhat above the national average.

The old city hall is the location of the police headquarters and the small (four-cell) city jail. At present, only 8 to 12 male prisoners can be confined in the jail at any one time. Most prisoners, including all females and youths, are sent to the county jail for confinement. A new city jail is being planned and will be housed in a new city administration building. It will be able to house about 20 inmates when it is opened in 1984. The police operate 22 vehicles at present.

Reported criminal incidents in Gillette rose over 90 percent between 1976 and 1982. Of the recent (1982) 1,363 arrests made by officers in Gillette, traffic-related offenses made up the majority. Programs instituted over the past several years to reduce crime in Gillette include a K-9 (dog) unit, neighborhood watch and crime-stopper programs, and a community awareness project.

Fire Protection

Fire protection services in Campbell County and the City of Gillette are provided by a joint city-county volunteer fire department with a 6,400-square-foot, 12-bay headquarters located in Gillette. In addition to the headquarters facility, the fire department has a network of 10 substations located in the area surrounding the city.

The number of fire runs in Campbell County grew by almost 50 percent between 1976 and 1982. Fire losses for this period in the county averaged approximately $1,600,000 per year.

Plans to construct a new substation and to add to available rolling stock are being considered for adoption in the next several years.

Estimated needs for volunteer fire fighters in Campbell County without the East Gillette Federal mine for the period 1982-90 indicate that the number of fire volunteers is expected to meet or exceed minimum requirements. At present, the ratio of firemen to population in Campbell County averages 2 per 1,000.

Health-Care Facilties

A hospital district was established in Campbell County in the mid-1970's. A hospital board to govern the Campbell County Memorial Hospital, one of the four medical facilities in the county, was also established. The other facilities in the county are the Northern Wyoming Mental Health Center, Pioneer Manor Nursing Home, and the Campbell County Public Health Building.

The County Memorial Hospital is a 52-bed, 3-story general hospital with the only facility in the county for short-term, acute care. Two additional floors are being added to the county hospital, which will increase its capacity to 183 beds. Hospital-bed occupancy has averaged 83 percent for the last 3 years. Adult admissions increased from 1,418 in 1977 to 3,772 in 1982.

The Pioneer Manor Nursing Home, a nonprofit institution, is the only extended-care facility in Campbell County. The home has a 120-bed nursing unit and an adjacent 69-unit apartment complex for elderly residents. The facility is staffed by 20 professionals and about 90 support personnel. Occupancy in 1982 was 95 percent. Future plans at the home call for the construction within the next few years of a 60-bed addition to the nursing component, about 70 new units to the adjacent apartments, and a sheltered-care facility.

The Gillette branch of the Northern Wyoming Mental Health Center provides mental-health services to the county. This facility is staffed by 14 persons. Caseloads have increased during recent years and the clinical professionals are fully occupied.

Campbell County has a new public health building. The facility contains nursing and health officer spaces, six clinics, a laboratory, and rooms for conferences and meetings. Campbell County employed 31 physicians, 10 dentists, and over 140 nurses in practice at the facility at the end of 1982. Other health-care personnel include 115 emergency medical technicians, hospital aids, and other support staff. Projected figures for the number of physicians required for Campbell County without the East Gillette Federal mine for the period 1982-90 show that a minor shortage of physicians currently exists in the county. This shortfall has persisted within the county for a number of years.

Water Systems

Water for the City of Gillette is provided by the city's Department of Public Works. It is obtained from wells located north of the city, via a 42-mile-long, 30-inch pipeline extending from a deepwater well-field (six wells which tap the

Madison aquifer) located near Moorcroft, and from local wells. The Madison wells have a capacity of 6.0 million gallons per day (gal/d); the local wells have a 2.4-million-gal/d capacity. Thus, the total water capacity available to the city if 8.4 million gal/d. Water use in 1982 averaged 2.3 million gal/d, with peak summer usage reaching 5.8 million gal/d. As a result, in 1982, under maximum-demand conditions, Gillette had 2.6 million gal/d of excess capacity (which would support in excess of 9,000 persons at a peak rate of 285 gal/d per person); under minimum-demand conditions, the city had an average excess capacity of 6.1 million gal/d.

Three storage tanks with a total capacity of 6 million gallons are used in Gillette at present. This storage capacity will be more than doubled in 1984, when a 7-million-gallon reservoir is added to the system.

Subdivisions which are located outside of the boundaries of Gillette receive water from a number of private water systems. The adequacy of these systems to meet local demands varies.

Wastewater Systems

Wastewater in the Gillette area in handled by sanitary and storm-water systems as well as by individual septic systems in outlying areas. The present sewage treatment plant in Gillette is an activated sludge facility with an average flow of 2.2 million gal/d and a peak summertime flow of 3.0 million gal/d. The facility, which was constructed in 1974 to serve a population of 14,000 and has a design capacity of 1.2 million gal/d, is generally considered to be over-burdened. Design work for a new sewage plant has been going on for about 5 years. If constructed, the new plant would be able to serve a population of 35,000. This facility would have a capacity of about 3.85 million gal/d initially, but could readily be expanded to 4.6 million gal/d.

Peak wastewater flow in 1990 for the City of Gillette without the East Gillette Federal mine is projected to be 5.4 million gal/d, an excess of 4.2 million gal/d over the design capacity (1.2 million gal/d) of the present wastewater facility. Were the new treatment plant constructed at its largest capacity (4.6 million gal/d), peak flows in 1985 and thereafter, estimated at 4.7 million gal/d, would still exceed capacity. However, average flows, which are about one-half of peak flows, could be accomodated through 1990.

Solid-Waste Disposal

Solid waste in the City of Gillette is collected by the Public Works Department and two private hauling firms. At present, residents of the Gillette area generate 1 ton per year of solid waste per capita.

Campbell County operates a new baling, transfer, and recycling station near an 80-acre sanitary landfill, which was 95 percent full in 1982. Waste from both city (on contract) and county residents is processed and then buried onsite at the landfill.

Four new 40-acre sanitary landfill sites, to replace the existing 80-acre site which is nearly full, are located west of Carter's Rawhide mine.

Without the East Gillette Federal mine, 50 landfill acres will be required to serve the solid-waste disposal needs of the residents of Campbell County during the period 1982-90. This figure represents about 30 percent of the 160-acre total; thus, considerable excess solid-waste capacity exists in the county.

Parks and Recreation

Extensive public and private opportunities for recreation exist in Campbell County for residents of both the City of Gillette and surrounding unincorporated areas. In addition, abundant Federal and State recreation lands are in relatively close proximity to residents of Campbell County.

The Campbell County Parks and Recreation Department is staffed by 27 full-time personnel and about 100 part-time or seasonal employees.

The county parks system consists of 15 units that include playgrounds, picnic areas, tennis courts, ball fields, and open space. At present, out of a total of approximately 500 acres of land that it controls, the county has about 150 acres of developed parkland outside Gillette.

A large indoor recreation center was opened in the mid-1970's and is one of the largest in the Rocky Mountain region. It provides space for court games, an indoor running track, a swimming pool, lounges, and other support facilities.

An updated county-park master plan is being completed, which will call for the future development of a 222-acre outdoor recreation area to support field and winter sports activities.

The City of Gillette has over 400 acres of parkland located in and around the city. They are operated by the Parks Department, which has a staff of 5 full-time and 12 part-time summer employees.

Library Facilities

Library services in Campbell County, including Gillette, are provided by the Amos Memorial Library and several smaller branch libraries. The main library is located in Gillette, contains about 55,000 volumes, and is staffed by 16 full-time and 5 part-time employees.

Library usage has grown steadily, as has the library's collection of materials. Circulation rose from about 112,000 in 1980 to approximately 137,000 in 1982.

The projected number of volumes needed in the Campbell County public library system without the East Gillette Federal mine for the period 1982-90 indicate that the present number of volumes is somewhat below the desired standard. However, construction on a new 100,000-volume Campbell County Public Library was completed in 1983 and, with the opening and eventual stocking of the new facility, this shortfall will likely be corrected.

Education

Public education in Campbell County is provided by the Campbell County Unified School District, which was formed in 1966 from 13 districts. As of October 1983, the school district comprised 1 high school, 2 junior high schools, and 18 elementary schools.

The total enrollment design capacity of the 10 elementary schools in the Gillette urban area is 4,390 students. In October 1983, 3,763 students were actually enrolled in these schools, leaving an overall excess capacity of 627. The eight elementary schools in rural areas of the county also had enrollments well below their capacity.

With the addition of Wright Junior/Senior High School in 1983, the secondary school capacity now stands at 3,800 students; enrollments in October 1983 numbered 2,679, leaving an excess capacity 1,121.

The ratio of students per household has stabilized at 0.64 students per permanent dwelling unit. This ratio is, however, assumed to increase slowly to about 0.67 by the latter part of the 1980's. By 1990, total enrollements without the East Gillette Federal mine are projected to increase by about 26 percent, from 6,964 in 1982 to 8,780 in 1990. Elementary school enrollments, which are projected to reach 5,751 in 1990, will still be under the current design capacity of 5,808 students. Secondary school enrollments in 1990 are projected to be only about 80 percent of the current capacity of 3,800 students.

In 1982-83, owing to the revenues available to the Campbell County School District from various mineral-development projects, the school district had a considerably higher district valuation ($204,869 per student) than did other districts in the State (on average, $79,748 per student). This allowed the district to construct a number of new school facilities and to improve its standards. In 1980, however, the Wyoming State Supreme Court declared the State's school financing system unconstitutional and instructed the State legislature to develop a more equitable system no later than 1983. A new financing system has been developed, which results in a recapture of excess revenues from certain wealthy districts, including Campbell County, which stands to lose revenues of $20 to $25 million a year.

Welfare and Social Services

Welfare and social services in the county are offered by the county branch of the Wyoming Department of Public Assistance and Social Services. The office employs ten persons. In general, the facilities to provide welfare and social services in the county are deemed to be adequate, but cuts in Federal funding have forced the department's county office to trim several of its programs.

Electric Power

Rural Campbell County receives electrical power from the Tri-County Rural Electric Association, located in Sundance, Wyoming. Residents of Gillette purchase electrical power from the city, which functions as a municipal utility. Power is purchased by the city at wholesale from the Black Hills Power and Light Company. In addition, under a 1982 contract with the Western Area Power Administration, Gillette can purchase up to 5 megawatts of power from this public utility. Future electrical demands may be met by purchases from private and/or public utilities.

Future plans call for a number of substantial improvements to the Gillette electrical transmission and distribution system. These plans include the purchase of existing powerlines from the Black Hills Power and Light Company, the development of a 230-kV interconnection at Wyodak Power Station, construction of two new substations, and a new transmission line.

Projected power demand figures for the City of Gillette without the East Gillette Federal mine for the period of 1982-90 indicate that power demand throughout this period would be below the available capacity of Gillette's two electrical power sources.

Public Finance

Revenues and expenditures for Campbell County for fiscal year 1981-82 through fiscal year 1983-84 indicate that general fund revenues provide by far the largest portion of total county revenues from property taxes, sales taxes, and other sources. Tax levels associated with library, musuem, fire, weed and pest, and other funds also contribute significant revenues. General fund expenditures cover over 20 department or activity categories. It is apparent that the county has the financial capability to provide necessary government services.

Revenues and expenditures for the City of Gillette indicate that general fund revenues include all taxes, license and permit fees, and intergovernmental transfers. The so-called enterprise fund revenue comes from the city charges for water, sewer, sanitation, and electrical services. Revenues for capital projects in fiscal year 1983-84 are associated with an optional sales tax, the Madison water project, the parking facility, and the wastewater plant. General fund expenditures primarily encompass government operating costs. Enterprise fund expenditures cover water supply, wastewater collection, sanitation, and power services. Revenue sources appear to be sufficient to pay operating costs for the City of Gillette.

Revenues and expenditures for the Campbell County School District for fiscal year 1980-81 and fiscal year 1981-82 indicate that local revenue sources include primarily property tax receipts, but also motor vehicle taxes and earnings on investments. Expenditures primarily were associated with instruction (teachers, books, instruction materials) and capital outlays. The school district appears to have adequate financial resources to satisfy both operating and capital facility needs.

Assuming that the range of services offered by the county and the City of Gillette remain at present levels, Campbell County and Gillette would appear in excellent fiscal condition without the East Gillette Federal mine. Oil and gas production, as well as increased coal production, should continually add to the assessed valuation.

CHAPTER IV

ENVIRONMENTAL CONSEQUENCES

This chapter analyzes the environmental consequences to all resources of implementing alternative A (approval of the mining plan, with or without conditions, and issuance of a Federal permit to mine coal, the preferred alternative), which consists of mining and reclamation as proposed by Kerr-McGee in its PAP. The socioeconomic impact of the East Gillette Federal mine in combination with other existing and proposed mines in the area could differ according to whether Kerr-McGee commenced operations shortly after issuance of the Federal permit or instead decided to delay construction of the mine for up to 3 years (the maximum time allowed by 30 CFR 786.25(b)(1)). The impacts of these two different cases are analyzed separately in the "Socioeconomics" section of this chapter. Impacts from alternative B (disapproval of the mining plan) are briefly discussed in chapter II.

Each section of this chapter begins with a summary of the anticipated environmental consequences printed in **boldface** type. The conclusions in the summary are documented in the discussion of site-specific impacts in the text that follows it. A discussion of cumulative environmental impacts from the six existing mines (Buckskin, Clovis Point, Eagle Butte, Rawhide, Fort Union, and Wyodak) and the two proposed mines (Dry Fork and East Gillette Federal) follows each site-specific discussion. Table IV-1 summarizes the unavoidable adverse effects of the proposed East Gillette Federal mine.

The interdisciplinary team has not analyzed the environmental consequences of the proposed mine in isolation: effects are considered as the difference between the total expected changes in each affected resource with the mine and other existing and proposed development, and the total expected changes in that resource during the same period without the mine. Thus, for example, the effect of the proposed mine on the population of Gillette is measured by the difference between the anticipated population with the mine and the anticipated population without it.

Moreover, the team has discussed environmental consequences in terms of their **significance**, using criteria set forth by the Council on Environmental Quality (40 CFR 1508.27), the total impact to the resource in the context of the resource within the region, the mitigation provided by the PAP, and the professional judgment of resource specialists on the team.

As the following analysis indicates, mining would not severely interfere with the future use of the region's or the Nation's renewable resources. The use of some resources--soils and vegetation, for example--would be decreased on the minesite during the life of the mine and into the reclamation period. However, the minesite would support the main land uses of the region (grazing and/or wildlife habitat) after reclamation is completed.

Because of the amount of, and impacts associated with, development already occurring in the Powder River Basin, the general acceptance of energy growth by the communities in the area, and the fact that about 60,226 tons of coal would be mined for each acre disturbed, the environmental consequences of mining the 256 million tons of coal at the East Gillette Federal site could not be appreciably

Table IV-1.--Summary of unavoidable adverse effects

Resource	Environmental consequences	Intensity[1] and context	Duration
Climate	Localized modification of the microclimate, including higher soil temperatures and reduced soil moisture on areas of bare ground.	Minor on minesite.	Life of mine.
Air quality	Increased TSP levels, but would be within Federal and State limits.	Moderate on minesite; negligible on a regional basis.	Life of mine.
Topography	Land surface would be lowered an average of 53 feet. Reclaimed surface would blend with adjacent lands.	Moderate on minesite; minor on a regional basis.	Permanent.
Geology	The natural geologic sequence would be disrupted on 2,604 acres. The physical properties of the overburden would be altered. Coal would be removed.	Major on minesite; minor on a regional basis.	Permanent.
Soils	Soils would be disturbed on 2,604 acres. Chemical and physical properties of soil would be altered. Productivity would be similar to premining conditions.	Major on minesite; minor on a regional basis.	Life of mine.
Hydrology	Streamflow outside the internally drained permit area would not change.	Minor on minesite.	Permanent.
	Sediment yield would increase both internally and offsite.	Moderate on minesite; minor on adjacent areas.	Life of mine.
	Destruction of existing aquifers and replacement with unconsolidated overburden.	Moderate on minesite.	Permanent.
	Decrease in quality of ground water in the replaced overburden.	Minor on minesite.	Permanent.

Table IV-1.--Summary of unavoidable adverse effects--Continued

Resource	Environmental consequences	Intensity[1] and context	Duration
Hydrology	Lowering of potentiometric surfaces by pumping and drainage into active pits.	Moderate on adjacent areas.	Life of mine.
Vegetation	Progressive loss of vegetation on 2,604 acres, replaced by vegetation of the same seasonal variety appropriate to postmining land use.	Major on minesite; minor on a regional basis.	Life of mine.
	Loss of about 300 AUM's a year.	Moderate on minesite; minor on a regional basis.	Life of mine.
Wildlife	About 1,000 acres of habitat unavailable in any given year.	Moderate on minesite; minor on a regional basis.	Life of mine.
	Increased road kills and general harassment.	Minor on a regional basis.	Life of mine.
Land use	About 1,000 acres a year will be unavailable for other uses.	Moderate on minesite; negligible on a regional basis.	Life of mine.
Transportation	Increased local traffic, resulting in increased noise, dust, and accidents.	Moderate on a regional basis.	Life of mine.
	About 24 unit trains per week at full production, resulting in delays at grade crossings, noise, and accidents.	Moderate on a regional basis.	Life of mine.
Recreation	Destruction of reservoir would eliminate fishing site; hunting would not be permitted on part of the mine area. Dispersed recreation would increase.	Minor on minesite and on a regional basis.	Life of mine.
Cultural resources	Known and unknown historic and prehistoric sites would be destroyed.	Minor on minesite owing to mitigation; currently minor on a regional basis.	Permanent.

Table IV-1.--Summary of unavoidable adverse effects--Continued

Resource	Environmental consequences	Intensity[1] and context	Duration
Visual resources	Minesite visible from travel route. Surface facilities located in remote area.	Major on adjacent areas.	Life of mine.
Seismic activity	Frequency and intensity of ground vibration from blasting would increase.	Minor on adjacent areas.	Life of mine.
Socio-economics	The project-related population increase of about 1,300 people would increase the demand for public services, especially health care and wastewater treatment.	Minor on a regional basis.	Life of mine.
	Cumulative impacts would also increase law enforcement demands.	Minor on a regional basis.	Life of mine.
	Delay of project start-up.	Moderate to major on a regional basis.	Construction; initial production.
Safety	Worker injuries would occur.	Minor on minesite and on a regional basis.	Life of mine.

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[1] Intensity: negligible = at lower levels of detection; minor = detectable but slight; moderat readily apparent; major = causing great change.

lessened by using a different method of mining or by mining elsewhere (U.S. Office of Surface Mining, 1980).

A. CLIMATE

The microclimate in the life zone near the ground would be modified on a local basis until revegetation is successful. The macroclimate would not be affected by the East Gillette Federal or adjacent mines.

Soil temperatures and near-ground temperatures would be higher in areas of bare soil than in areas of vegetated land, and moisture availability in the soil would be reduced. Wind speed directly adjacent to the surface would be slightly higher, causing an increase in erosion and mechanical abrasion of exposed soil by moving particles. Local minesite wind patterns may be changed by the postmining topography.

B. AIR QUALITY

Mining would cause moderate degradation of the air quality at the East Gillette Federal mine. Long-term postmining impacts on local air quality would be negligible. Although TSP concentrations would increase near the minesite, no violations of the Federal or Wyoming TSP primary or secondary standards are predicted. Owing to regional mining activities, a violation of the Wyoming annual particulate standard of 60 µg/m^3 may occur under worst-case conditions at the Eagle Butte mine (62 µg/m^3). Visibility would be reduced only slightly and increased concentrations of gaseous emissions attributable to mining operations would be within both Federal and State standards.

Site-Specific Effects

Air-quality changes resulting from, or associated with, mining operations at the East Gillette Federal mine would be limited primarily to the operational life of the mine. The changes during this time would result in increased TSP levels in the near vicinity of the mining operation. Chemical dust suppressants and watering would be used on roads to control fugitive dust. Maximum air-quality impacts from the proposed mine alone would be 28 µg/m^3 within the property boundary (fig. IV-1). The location of the maximum TSP concentrations would shift as mining progresses. Concentrations of gaseous emissions attributable to fuel combustion at the minesite would be expected to increase, but not significantly. Compliance with State and Federal standards would be easily attained.

On November 13, 1978, Wyoming DEQ, Air Quality Division, issued an air-quality permit to Kerr-McGee to construct the proposed mine (permit CT-178). On May 2, 1979, the U.S. Environmental Protection Agency issued a Prevention of Significant Deterioration permit to the applicant. Since 1979, the applicant has requested several extensions of its Wyoming air-quality permit because of delays in construction of the proposed facility.

Cumulative Effects

In 1978, dispersion modeling analyses evaluating potential TSP impacts were performed by a contractor, Environmental Research and Technology, for the

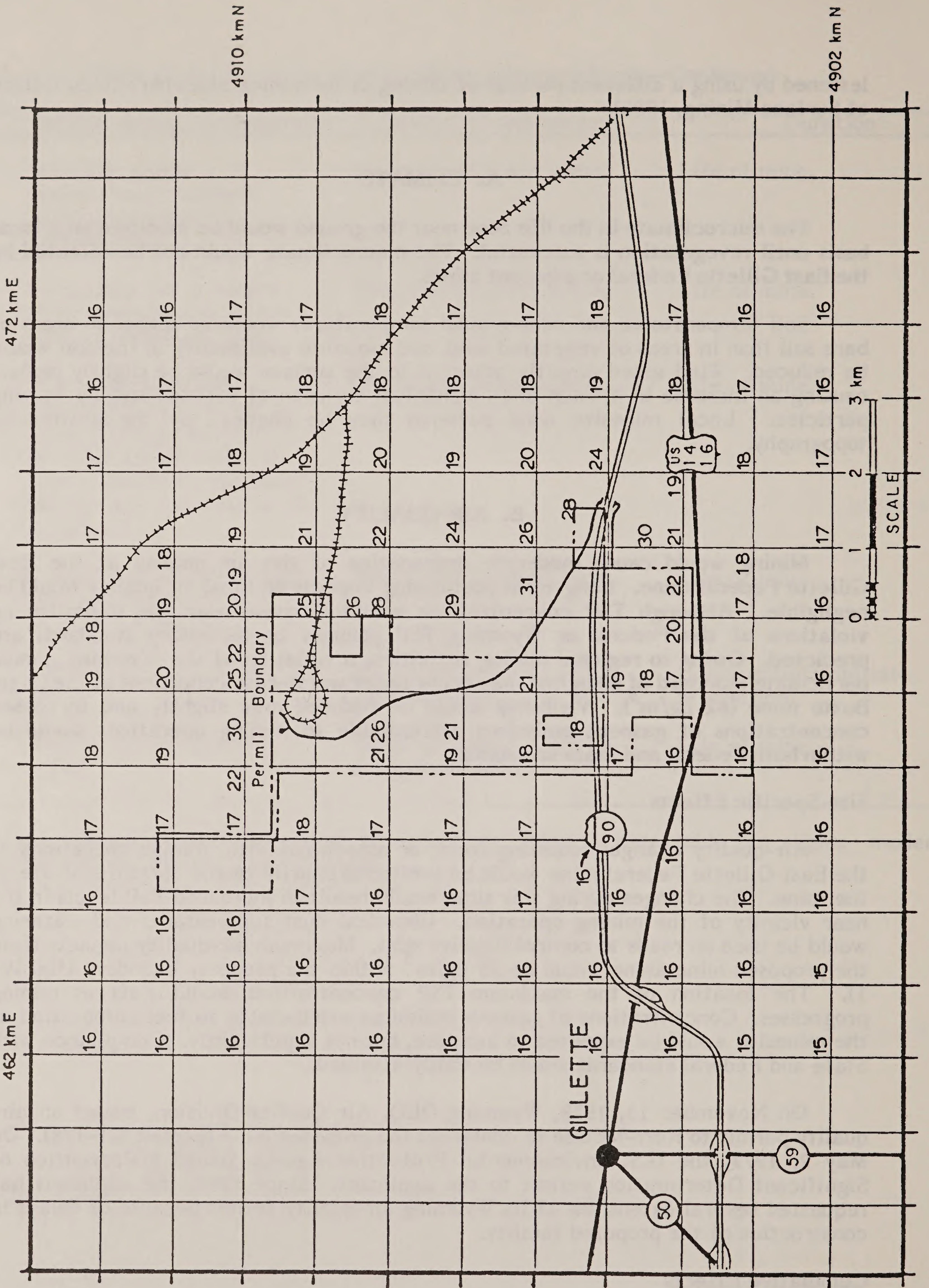

Figure IV-1.--Annual ambient geometric mean TSP concentrations predicted for the proposed East Gillette Federal mine alone during the worst-case impact year (μg/m^3).

applicant. These analyses were performed for a projected year when cumulative impacts of the mines in the area to air quality were expected to be greatest; they indicated that maximum predicted annual TSP concentrations from the proposed East Gillette Federal mine and nearby mines and operations would be approximately 62 $\mu g/m^3$. This value, which exceeds the Wyoming standard of 60 $\mu g/m^3$, would impact the northwest corner of the Eagle Butte mine. The maximum impact at the East Gillette Federal mine would be 45 $\mu g/m^3$, factoring in TSP concentrations from all regional mining activities (fig. IV-2).

Figure IV-3 is an isopleth map depicting cumulative annual particiulate concentrations for regional mining activities near the East Gillette Federal mine. The impact of the proposed mine on the Gillette area would be less than 1 $\mu g/m^3$ (Environmental Research and Technology, 1978). The modeling impact analyses performed by the contractor did not account for deposition of particulates, which would account for gravitational settling or fallout at or near the source. Therefore, results from the dispersion modeling impact analyses are rather conservative.

C. TOPOGRAPHY

Impacts on the topography would be moderate on the minesite, but minor on a regional basis. The thin overburden conditions would result in a lower overall elevation of the mined area by an average of 53 feet.

Site-Specific Effects

Mining would permanently remove the few prominent and varied topographic features on the 2,604 acres of the minesite and the overall postmining topography would be substantially flatter than premining conditions (figs. IV-4 and IV-5). The proposed land use after mining would not be affected by the topographic changes. The basic drainage network would change somewhat and would result in two depressions designed to maintain the present internal drainage pattern in sec. 17; some smaller gullies would be eliminated. See the "Hydrology" section of this chapter for further details.

The change in surface elevation over the area to be mined would vary from a maximum decrease of about 180 feet to local increases of 20 feet. The overall land surface would be lowered an average of 53 feet. Final topographic elevations would be dependent on the swell factor of the backfilled overburden. The swell factor has been estimated to be 15 percent. Should the average swell factor be higher than anticipated, the decrease in elevation would be less. The average slopes on the backfilled area would be 4.9 percent (2.8°), with an average elevation of 4,434 feet.

The reduction of overall slope measurements, in conjunction with the depressions which would be left, would result in minor reductions in peak water flows from the drainage area, thereby increasing infiltration rates and the availability of moisture on the minesite.

Cumulative Effects

Similar changes to the topography of the eastern Powder River Basin are occurring on lands adjacent to the East Gillette Federal mine as a result of other surface mining activities. These surface mining activities would reduce the

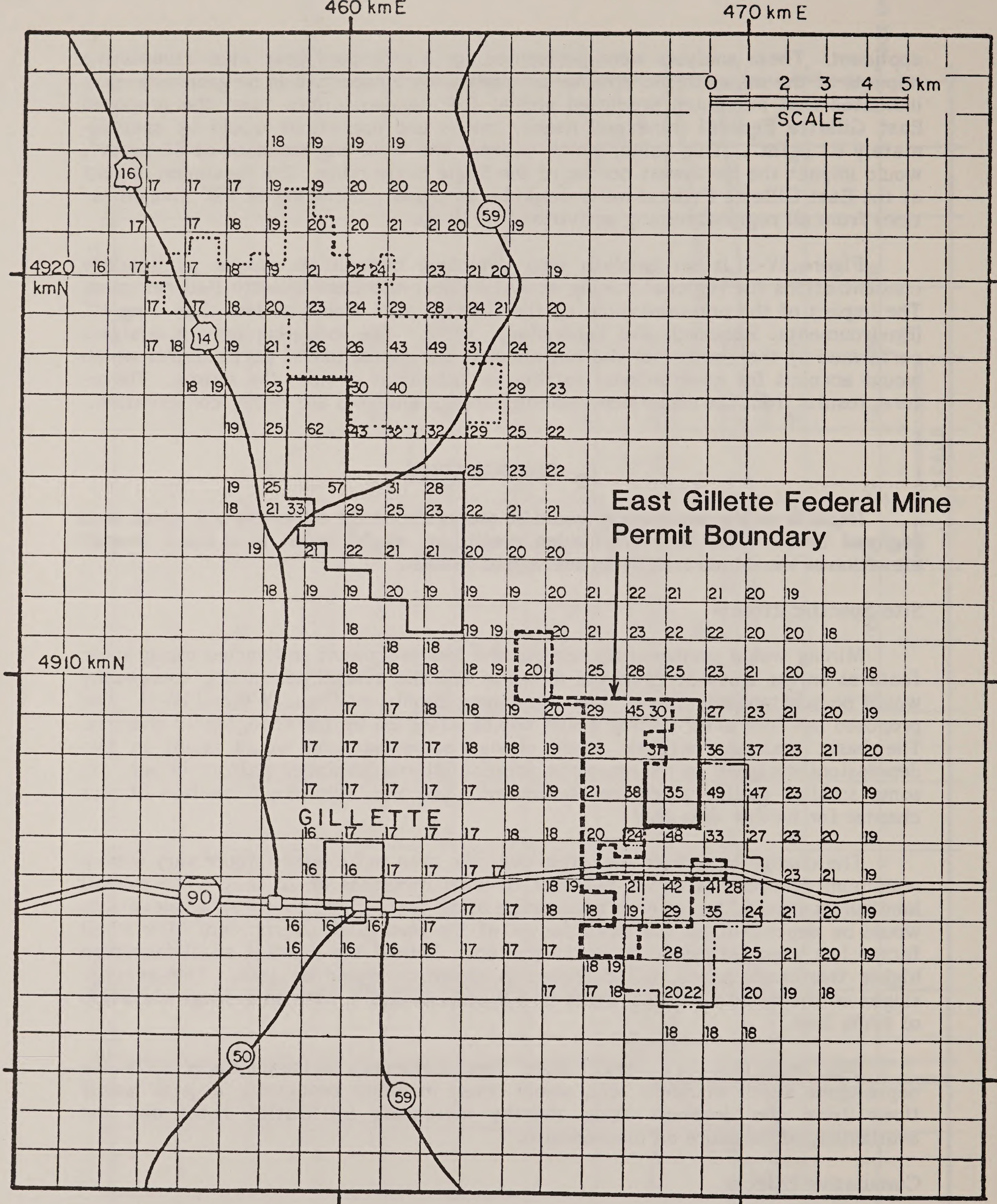

Figure IV-2.--Annual ambient geometric mean TSP concentrations predicted for the regional mining activities near the proposed East Gillette Federal mine during the worst-case impact year ($\mu g/m^3$).

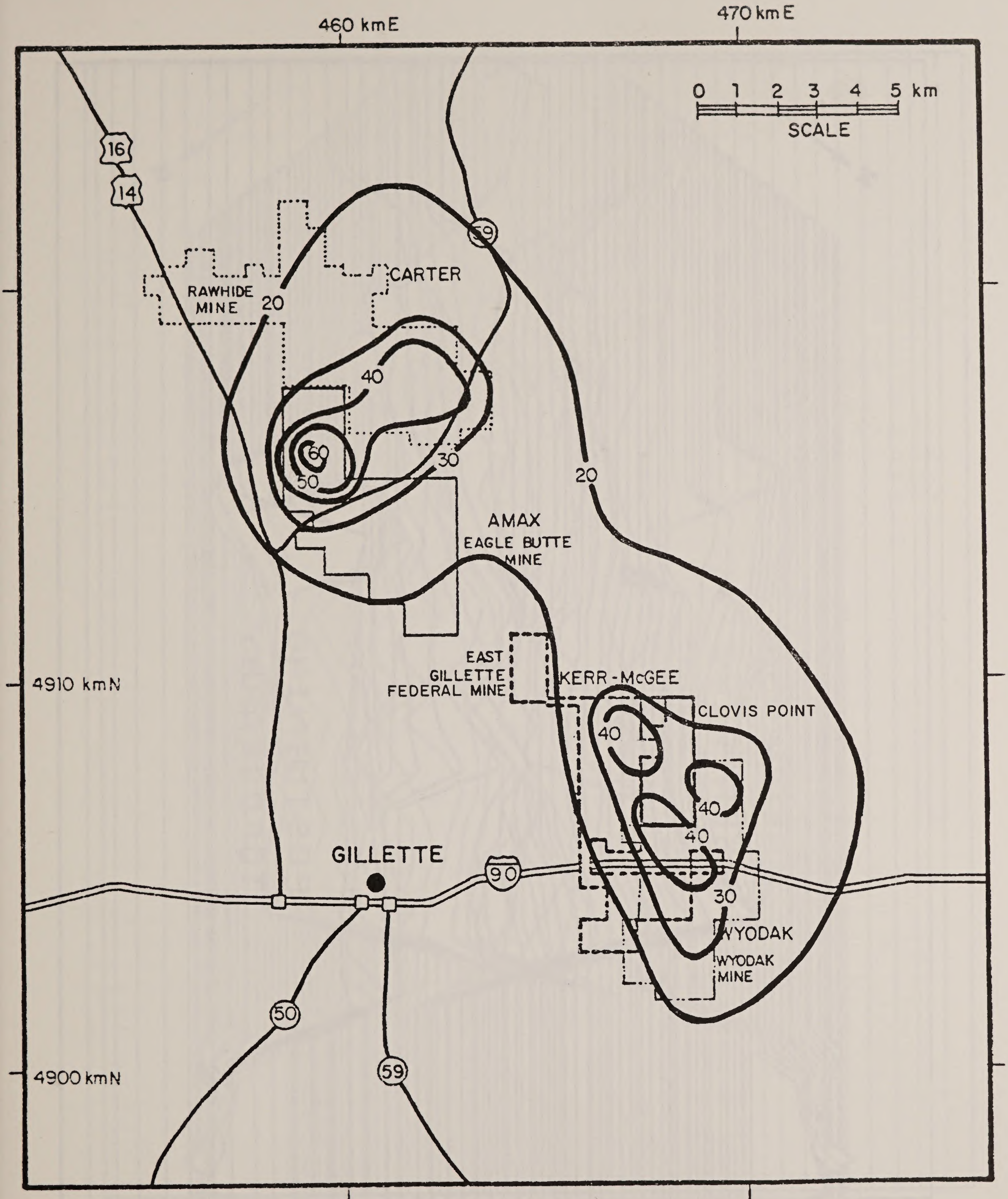

Figure IV-3.--Isopleths of annual ambient geometric mean TSP concentrations predicted for the regional mining activities near the proposed East Gillette Federal mine during the worst-case impact year ($\mu g/m^3$).

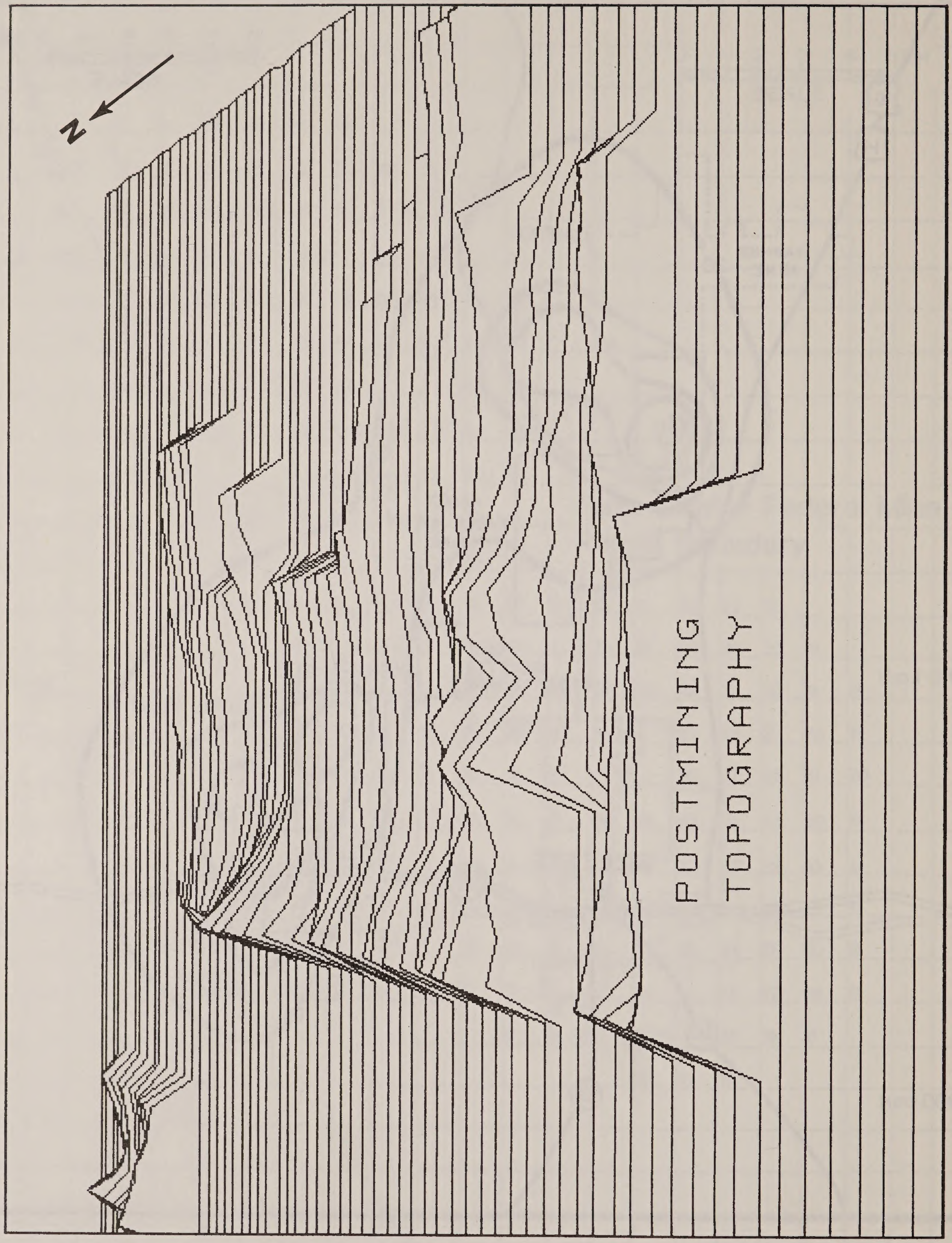

Figure IV-4.--Postmining topography at the East Gillette Federal mine.

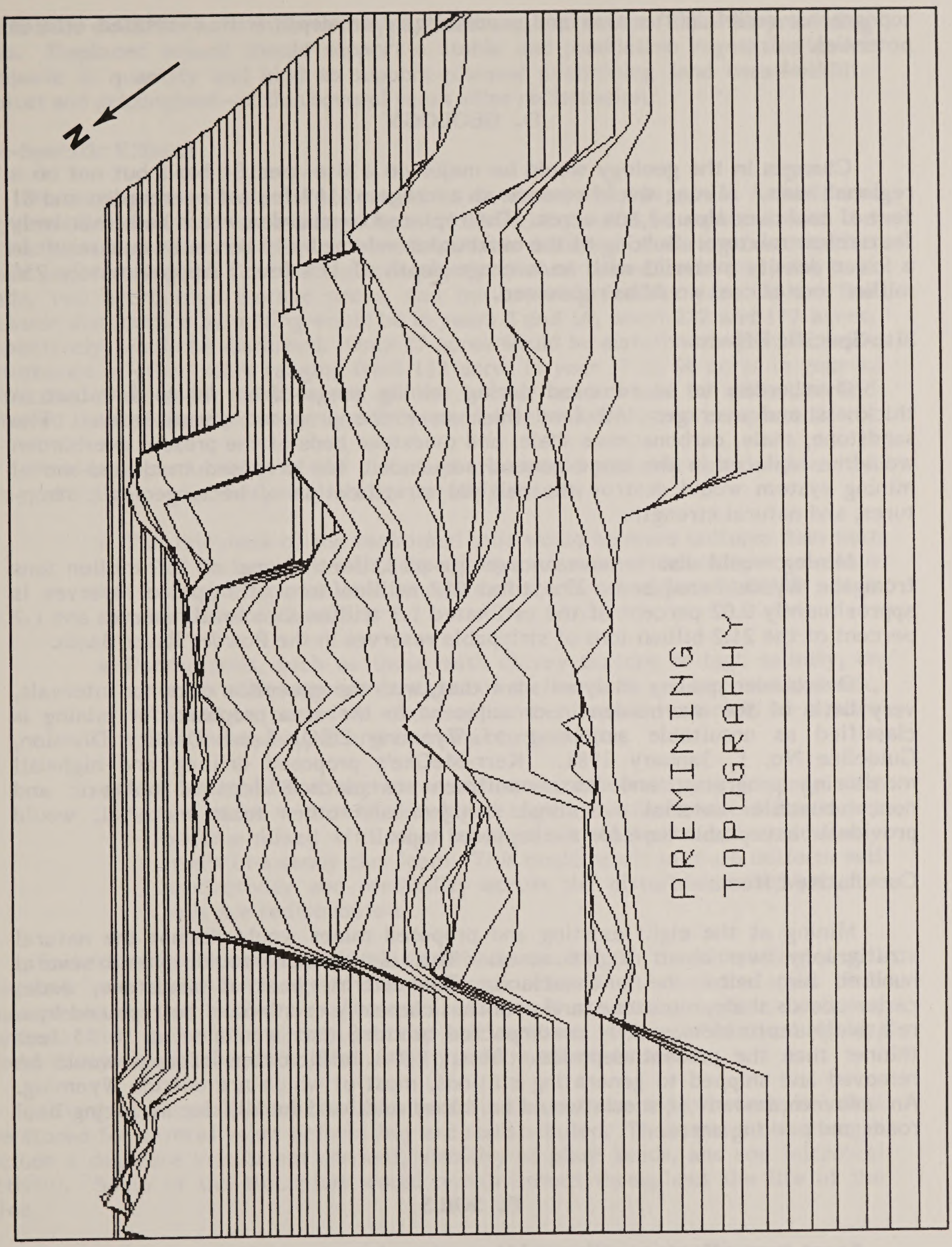

Figure IV-5.--Premining topography at the East Gillette Federal mine.

topographic relief in the area and produce gentler slopes with decreased erosion potential.

D. GEOLOGY

Changes in the geology would be major on a site-specific basis but not on a regional basis. Mining would remove an average of 149 feet of overburden and 81 feet of coal over about 2,604 acres. The replaced overburden would be a relatively featureless mixture. Bulking of the overburden volume by 15 percent would result in a lower density material with an average depth of 179 feet. Approximately 256 million tons of coal would be recovered.

Site-Specific Effects

Overburden to be removed during mining ranges from 40 to 260 feet in thickness and averages 149 feet thick over the proposed permit area. The sandstone, shale, carbonaceous shale, and mudstone beds of the present overburden would be replaced in the same general sequence. The proposed truck-and-shovel mining system would destroy the original stratification of beds, geologic structures, and natural strength.

Mining would also remove an average of 81 feet of coal or 256 million tons from the Wyodak coal bed. The total 287 million tons of in-place reserves is approximately 0.02 percent of the estimated 1.3 trillion tons total reserves and 1.2 percent of the 21.2 billion tons of strippable reserves in the Powder River Basin.

Overburden quality analyses show that, with the exception of minor intervals, very little of the overburden in or adjacent to the area proposed for mining is classified as unsuitable according to Wyoming DEQ, Land Quality Division, Guideline No. 1, January 1981. Kerr-MeGee's proposed drilling and highwall monitoring programs, and its commitment to place 8 feet of nontoxic and noncombustible material over coal stringers and other toxic material, would provide an acceptable base for the replaced topsoil.

Cumulative Effects

Mining at the eight existing and proposed mines would disrupt the natural stratigraphy over about 30,540 acres. This disturbance would extend several hundred feet below the land surface. The discrete beds of sandstone, shale, carbonaceous shale, mudstone, and coal that currently exist would be replaced by a relatively featureless, partly recompacted mixture that would be up to 75 feet thinner than the present deposits. About 2,741 million tons of coal would be removed and shipped to generating stations, most of which are outside Wyoming. An unknown amount of scoria would be mined and used locally for surfacing haul roads and parking areas.

E. SOILS

Short-term effects to soils would be major; long-term effects would be minor. During construction and mining, topsoil would be progressively disturbed on 2,604 acres. After reclamation, the soils would be unlike premining soils in texture, structure, color, accumulation of clays, organic matter, and chemical composition.

These soils would be more uniform in type, thickness, and texture than the premining soils. Replaced topsoil should support a stable and productive vegetation cover adequate in quantity and kind to support planned postmining land uses—wildlife habitat and grazingland—within several years after reclamation.

Site-Specific Effects

As mining progresses, the soil would be disturbed on 2,604 acres. A minimum depth of 30 inches, with an average depth of 32 inches, would be replaced over the entire disturbed area. Maximum annual surface disturbance during construction would occur during the first year of construction, when the railroad spur, the haul roads, two overburden storage areas, and the crushing facility are built. The greatest disturbance by mining would be in years 2 and 14, when 272 and 177 acres, respectively, would be disturbed. Only 25 acres would be disturbed in year 24, with disturbance in other years ranging from 112 acres in year 17 to 64 acres in year 4. A maximum of about 1,000 acres of the permit area would be disturbed and removed from production at any one time where reclamation is not completed.

The total productivity of the disturbed area would probably remain about the same, although productivity may change locally because:

- The thickness of the reclaimed soils would be more uniform than that of the present soils, especially on areas affected by coal-seam fires, where variable amounts of scoria are exposed, and on rough and broken land.

- Poorer soils, such as those with clayey texture or high salinity, or areas with large percentages of shallow soils and exposed bedrock, would be buried or mixed with other topsoil materials to a more uniform physical and chemical composition.

- Uniformity of soil texture would be increased: clayey or sandy soils and those with well-developed argillic horizons would inevitably become mixed with other materials in stockpiles and would likely result in a sandy clay loam. This could result in more uniform soil productivity and erodibility across the disturbed area when the soils are redistributed.

Soil-forming processes would be disturbed, resulting in the alteration of soil characteristics and in a change of the taxonomic classification of the soils. Soil characteristics that would be affected include soil structure, argillic horizons, horizons with carbonate accumulations, soil texture, soil erodibility, salinity, productivity capabilities, biological activity, and nutrient content.

Changes in topsoil characteristics could occur in those topsoil stockpiles that are stored for several years before they are redistributed. These potential changes include a decrease in nutrient content, viability of plant seeds, and soil microbial activity. Some of the stockpiles would remain intact throughout the life of the mine.

Cumulative Effects

Together, the East Gillette Federal mine and the seven mines located within the 5-mile radius of it have permit areas totaling about 30,540 acres. An average of 70 percent of this acreage would actually be disturbed during the life of the mines and about one-half of the total disturbance would be affected at any one time. Thus, about 10,690 acres would be unreclaimed at any one time. Eventually, all disturbed lands would be reclaimed for use by livestock and wildlife.

F. HYDROLOGY

The effects of the proposed East Gillette Federal mine on the surface-water hydrology would be moderate during the life of the mine and minor after reclamation is completed. Since 85 percent of the permit area is internally drained, there would be little effect on stream flows outside the permit area. During mining, runoff characteristics would change and sediment discharge would increase over the disturbed area. Much of the sediment would be trapped in ponds or deposited in closed basin playas. Runoff from the disturbed area would have a slightly higher TDS content. After reclamation is completed, runoff rates, the quality of runoff water, and sediment-yield rates would revert to near premining levels. However, the quantities of runoff to some specific closed basins would be changed because of permanently altered drainage areas.

The mining would remove the Wyodak coal and overburden aquifers and replace them both with unconsolidated overburden. Pit seepage would lower the water level in the coal aquifer as much as 5 feet up to a mile to the west of the permit-area boundary. Maximum extent of drawdown in the overburden aquifer would be 1,800 feet from the permit boundary. The resaturated backfill would be more highly mineralized than would the premining water in either aquifer, but would still be suitable for postmining grazing and wildlife use.

Site-Specific Effects

Surface water.--The effects of surface mining on surface-water hydrology in the area of the East Gillette Federal mine would result from alteration of runoff-producing characteristics (including infiltration capacities of the reclaimed soil materials, hillslope and channel gradients, and vegetative cover) and from changes to the contributing areas of specific drainages. In the short term, runoff quantities from the proposed permit area would increase somewhat where land had been denuded during mining. Loss of vegetative cover and soil structure would be the primary causes of the increased runoff. However, these runoff quantities would gradually decrease as reclamation is completed and vegetative cover is restored. In the long term, runoff quantities would approximate premining levels.

Environmental consequences to offsite areas and receiving streams, resulting from changes in drainage-area size, would be minor. The topography of the East Gillette Federal mine permit area is characterized by several closed basins which drain 85 percent of the permit area. The postmining topography would exhibit a similar percentage of internal drainage. The only receiving stream off the permit area that may be affected by the proposed operation is Dry Fork, a tributary of the Little Powder River. A portion of the permit area, in sec. 6, T. 50 N., R. 71 W., currently drains to this stream; this drainage would be retained in the postmining topography, its size and slope gradients would be equivalent to the premining condition, and long-term runoff quantities from it should approach premining levels. This basin would likely experience some increase in erosion rates until vegetative cover is reestablished. However, most of the sediment produced would be deposited on the valley floor or in a sediment pond near the permit boundary.

Thus, the proposed mining should have little or no effect on the surface flows to offsite areas and receiving waters.

Within the permit area, the alteration of the size and locations of the closed basins would significantly change the distribution of runoff to the various playa lakes. For example, runoff from parts of secs. 8, 17, and 20, which presently drains either into Springen Hollow or to Ditto Lake, would drain into two new large depressions in that part of the permit area. As a result, the postmining drainage area of Ditto Lake would be reduced to only 55 percent of its premining size. This would result in an estimated 33 percent, or 7 acre-foot, reduction in annual runoff to Ditto Lake playa. Assuming, as is the present case, that Ditto Lake water would be lost to evaporation after mining, the projected reduction of runoff would result in no appreciable change. However, should the local ground-water flow patterns be altered by the mining and reclamation activities, as suggested in the discussion of ground water (below), the reduction of runoff to Ditto Lake may take on added importance. The reduction of runoff to Springen Hollow would probably not be significant, assuming that part of the water collected in the new basins would percolate to the ground-water table below these depressions.

Eight livestock watering ponds within the permit area would be destroyed during mining. Sediment ponds would be constructed at each point where a drainage would exit the reclaimed area. Four of these would be permanent impoundments to provide water for wildlife and livestock. Since most runoff from the permit area drains internally, these ponds should have little net effect on the volume of runoff reaching the playa lakes. Diversion ditches or dikes used in conjunction with the ponds may produce some sediment, owing to minor local scouring. Any sediment produced would be retained in the sediment ponds. Because the source of water in these ponds is precipitation runoff, the chemical quality of pond water would be similar to that of present stock ponds and would be suitable for wildlife and livestock watering.

Sediment yields from disturbed areas would be two to five times those from undisturbed areas until reclamation is complete. This would amount to 0.2 to 1.5 acre-feet of sediment per mi^2 annually, or a total of 2.3 acre-feet in any one year, assuming that the maximum area disturbed, including buildings and roads, is 1,000 acres at any one time. Any sediment produced would be retained in sediment ponds or within the closed basin where it originated and would have no effect outside the permit area. Because of similar or flatter slope gradients and the possibility of better vegetative cover, postmining sediment yields may be less than premining yields.

After mining and reclamation are complete, surface-water flow and quality, and sediment production from the entire permit area, would gradually revert to premining levels. However, alteration of the sizes of some of the closed basin areas would result in runoff volume differences within specific basins.

Ground water.--Development of the proposed East Gillette Federal mine would affect the ground-water resources of the area in four ways: (1) mining would destroy the coal and overburden aquifers and replace them with unconsolidated overburden; (2) water levels in the coal and overburden aquifers adjacent to the mine would be lowered as a result of seepage into the open pit; (3) the potentiometric surface of the deep Fort Union aquifer would be lowered in the vicinity of the mine as the result of pumping water to supply the mine; and (4) the quality of the ground water from the coal aquifer would be reduced as it flows through the replaced spoils.

Removal of aquifers.--Mining at the East Gillette Federal mine would remove both the coal aquifer, which is the principal source of shallow ground water in the area, and the overburden aquifer, and would replace them both with the broken and fragmented shales, siltstones, and sandstones of the Wasatch Formation. This overburden would be truck-dumped into the mined-out pits in several lifts, resulting in a gradation of material size within each lift with the coarsest particles at the bottom. Compaction by trucks of the upper layers of the lifts would create zones of low permeability compared to permeabilities in the lower sections of the lifts. The net result would be a single aquifer with zones of varying permeabilities. It appears that the lower layers within each lift of the replaced spoils may be several times more permeable than is the undisturbed coal, while permeabilities of the upper layers of the lifts would be similar to or slightly lower than those of the undisturbed coal.

The replacement of the coal and overburden aquifers with a spoils aquifer would remove the present ground-water divide across sec. 17, with the resultant ground-water flow direction being from the southwest toward Springen Hollow. The absence of the ground-water divide, along with the presence of relatively higher per meability zones in the spoils aquifer, would also increase the ground-water flow rate through the permit area to Springen Hollow. Assuming reasonable hydraulic connections with the scoria deposits, there would be the added consequence of transmitting water from the Ditto Lake scoria deposit at a faster rate, thereby affecting the equilibrium water level of that deposit. In this event, the possibility of flushing the accumulated salts of Ditto Lake into the ground-water system would exist. However, this possibility is apparently small, since there seems to be little direct vertical hydraulic communication between the lake waters and the ground water in the underlying scoria.

Mining should have little affect on ground-water recharge. Recharge to the undisturbed scoria deposits would not be affected. During mining and for some years after reclamation is completed, onsite recharge of the spoils aquifer may occur at a faster rate than the rate at which the coal aquifer is currently recharged by the Wasatch overburden. This is based on the assumption that the reclaimed spoils aquifer would initially have a higher vertical permeability than does the present material, that sufficient vegetative cover would be present to reduce the volume of surface runoff, and that gentler postmining slopes would reduce the surface runoff rate.

Lowered water levels.--The applicant estimated seepage quantities using the non-equilibrium well formula of Theis (1935) and the seepage-face concept proposed by Jacob (1957) to calculate inflow to a hypothetical well 1,000 feet in diameter. The well location was changed to correspond with the movement of the mine pits. The calculated rates vary with location mainly because of the variation in saturated thicknesses of the aquifers. The seepage rates for the overburden aquifer ranged from 24 gal/min for the first 2 years, to 74 gal/min in year 21, to 6 gal/min in the last year of mining. Seepage rates from the coal aquifer ranged from 27 gal/min in the first 2 years, to 333 gal/min in year 15, to 8 gal/min in year 25. These values are composites of seepage rates to all pits open in a given year.

This seepage would create an area of lowered water levels around the active pits. The extent of these drawdowns was calculated using a model for fully penetrating wells with variable pumping rates (Warner and Yow, 1979). The average pit-seepage rates were used as pumping rates for this model. The accuracy of drawdown calculations is such that the 5-foot drawdown contour is generally considered the maximum extent of drawdown. Figure IV-6 shows the extent of 5 or more feet of drawdown in the coal aquifer for the life of the mine. This contour would extend 4,000 to 5,000 feet from the boundary around most of the permit area. The maximum extent of the 5-foot drawdown contour in the overburden aquifer over the life of the operation would be 1,800 feet from the permit boundary near the southwest corner of sec. 6. The 5-foot drawdown contour for the overburden would be less than 1,500 feet from the rest of the permit boundary and would be as little as 500 feet from some parts of the southern boundary.

There are 108 wells located within the life-of-mine 5-foot drawdown contour for the coal aquifer (fig. IV-6). Of these, 69 are owned by mining companies and 39 are owned by private, nonmining interests. Most of the company-owned wells are used for ground-water monitoring and are subject to removal during mining. Most of the noncompany wells are used for livestock watering. Eleven of these wells are drilled in scoria and should not be affected by mining. Of the remaining 28 wells, 24 are subject to removal during mining. The company is committed to replacement of water supplies of any wells damaged by mining.

The seepage and drawdown calculations are based on worst-case conditions; therefore, the actual pit-seepage rates and extent of drawdowns are expected to be less than the values shown. Onsite inspection of the adjoining Clovis Point mine suggests that low seepage rates can be expected.

Deep aquifer water levels.--The applicant plans to obtain 38,000 gal/d of water for domestic and industrial use from a well tapping the Tullock Member of the Fort Union Formation at a depth of about 1,200 feet. The applicant would also use an average of 115,000 gal/d of water for dust control. Some of this water would come from seepage into the active pits. However, supplemental well water would be required for dust control.

Assuming that the well supplying domestic and industrial water is pumped constantly at a rate of 50,000 gal/d (35 gal/min) for a year, the potentiometric surface in this aquifer would be drawn

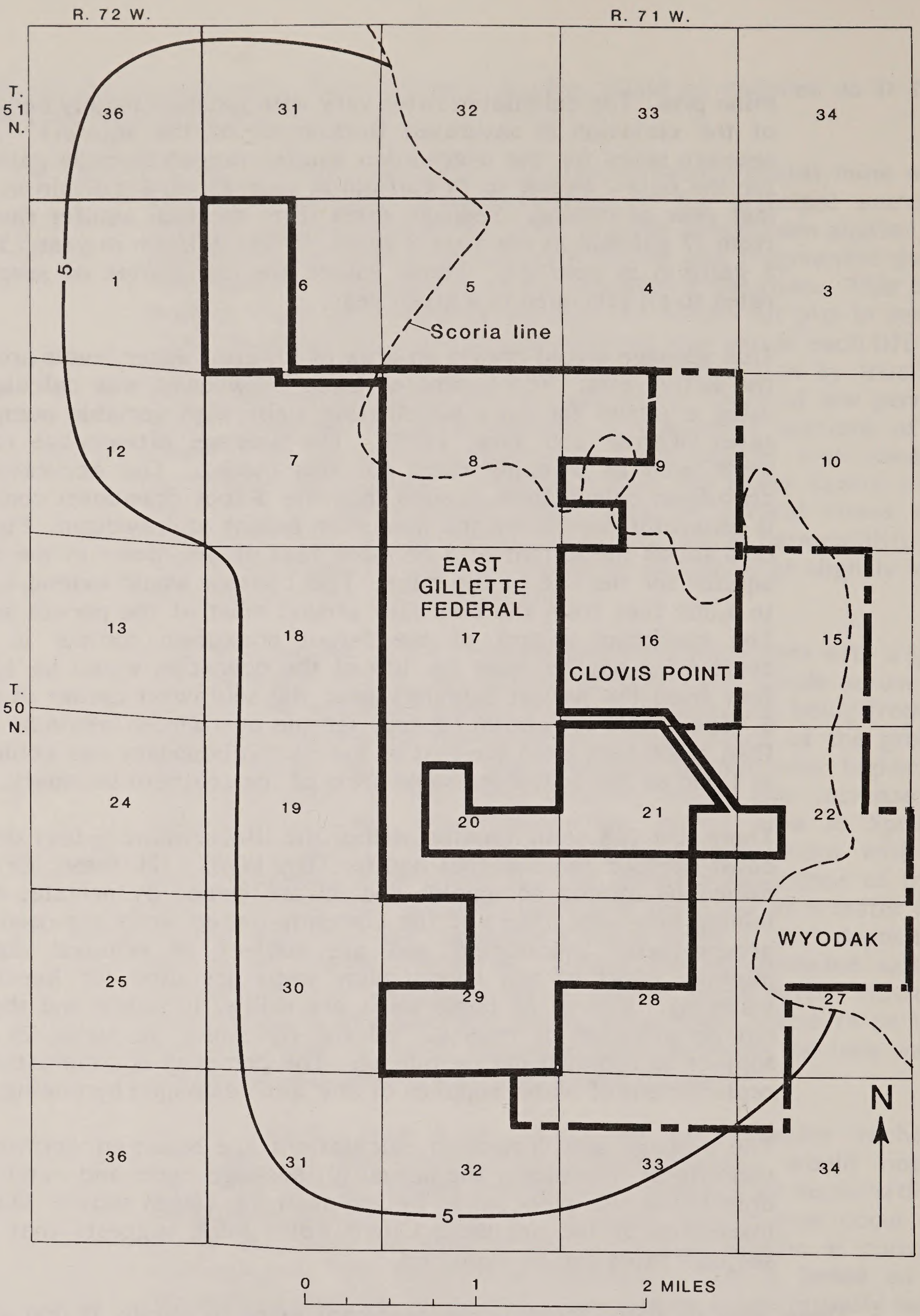

Figure IV-6.--Maximum extent of 5-foot drawdown in the coal aquifer for the life of the mine. (Compiled from information provided by applicant.)

down about 13 feet at a distance of 1 mile from the well. The drawdown 2 miles away would be 8 feet, and 5 miles away would be less than 1.5 feet. This decline would be in addition to the long-term decline of 5 feet a year reported for the deep well on the Wyodak Resources Development Corporation property. However, the potentiometric surface would still be several hundred feet above the top of the aquifer and the main impact would be increased pumping lift costs. Since the projected usage is less than 50,000 gal/d, these drawdowns should be considered worst-case maximums. Only two wells are known to tap the Tullock Member within 2 miles of the proposed East Gillette Federal mine well--the well at the Clovis Point mine in sec. 9 and a public-supply well owned by Country Side Users in sec. 18.

Water quality.--The main effect on ground-water quality would be the increased mineralization of water passing through the spoils aquifer. As the overburden is broken up in course of its removal and replacement as spoil, fresh surface is exposed to the ground water moving through it. Because this water is not saturated with respect to any mineral constituents, it is able to dissolve many of the newly exposed minerals. Therefore, ground water in the spoils would become more highly mineralized than is water in the adjacent aquifers. Rahn (1976) and Van Voast (1976) have found that ground water in spoils contains greater amounts of calcium, sulfate, magnesium, manganese, and TDS than does water in the undisturbed aquifers. TDS in the spoil water at the East Gillette Federal minesite may increase from the present range of 500 to 1,500 mg/L to a range of 1,500 to 5,000 mg/L. However, such an increase would be acceptable because water containing these TDS concentrations is still suitable for watering livestock, the current and proposed use of ground water in the permit area. No significant concentrations of trace or heavy elements are expected.

In time, water moving through the spoils would dissolve out the newly exposed minerals and eventually restore the water to a quality comparable to that of the adjacent aquifers. However, given the slow rates at which ground water moves, the process may take on the order of hundreds of years to be completed. The change in water quality in the spoils should, therefore, be considered permanent.

Alluvial valley floors.--There are no AVF's on or adjacent to the permit area that would be affected by the proposed mining.

Cumulative Effects

Surface water.--There are six surface coal mines (Buckskin, Clovis Point, Eagle Butte, Rawhide, Fort Union, and Wyodak) in operation near the East Gillette Federal mine; one more (Dry Fork) has been proposed for operation. These mines form a southeast-trending strip extending from about 10 miles north of Gillette to about 6 miles east of the city. The mines lie within the Belle Fourche River and Little Powder River Basins. Table IV-2 shows the drainage basin and the estimated area of disturbance for each mine. Donkey Creek is a tributary of the Belle

Table IV-2.--Immediate drainage basin and estimated area of disturbance for the Gillette area mines

Mine	Immediate drainage basin	Acres of AVF	Acres disturbed Acres	Acres disturbed Square miles
Existing mines				
Buckskin	Rawhide Creek, Spring Draw	63	959	1.50
Clovis Point	Donkey Creek, Prairie Creek, internal	---	1,032	1.61
Eagle Butte	Dry Fork Little Powder River, Little Rawhide Creek	---	3,470	5.42
Fort Union	Prairie Creek, Donkey Creek, Dry Fork Little Powder River, internal	64	2,436	3.80
Rawhide	Dry Fork Little Powder River, Little Rawhide Creek, Rawhide Creek	---	4,921	7.69
Wyodak	Donkey Creek, internal	---	1,717	2.68
Proposed mines				
Dry Fork	Dry Fork Little Powder River, Prairie Creek	365	2,905	4.54
East Gillette Federal	Donkey Creek, Dry Fork Little Powder River, Prairie Creek, internal	0	2,604	4.07
Existing and proposed mines				
Total		**492**	**20,044**	**31.31**

Fourche River; the other streams are tributary to the Little Powder River. A total of about 30,540 acres is included within the permit areas for the eight mines and about 20,040 acres would be disturbed in the mining process (table IV-2).

Despite the fact that more than 20,040 acres would be disturbed during the predicted extent of mining operations, long-term impacts to the surface-water resources of the area are expected to be minor. Several of the mine permit areas include large areas of internal drainage (table IV-2), and these closed basins would be restored in the postmining topography. Although the size of some of the closed basins would be changed, the total area of internal drainage would be approximately the same as before mining. The presence of significant areas of internal drainage would minimize the cumulative effects of mining on the surface-water resources of this area.

Ground water.--The principal shallow aquifer in the vicinity of the eight Gillette area mines is the Wyodak coal that is to be mined. Overlying this coal is a discontinuous aquifer in the Wasatch overburden. Mining and reclamation would disrupt these aquifers and replace them with a single aquifer of fragmented overburden. This aquifer would have hydrologic characteristics similar to the average values for the existing coal and overburden aquifers and would eventually resaturate to levels intermediate between those in the original overburden and those in the coal aquifers. Because new material surfaces would be exposed to the water, the water would be more highly mineralized than that in the original aquifers. However, it still would be suitable for livestock watering, the principal postmining use.

Dewatering of the coal usually occurs through pit seepage and collection of the water in sumps in the pit floors. Where ground water is abundant, it may be necessary to install dewatering wells around the pit. Most of this water is used for dust control. Excess water would be passed through a holding pond before it is released into local drainages. The amount of water seeping into the pits would vary with the number and size of the pits, the number of partings in the coal, and the saturated thickness of the coal and overburden. Company estimates of pit seepage indicate that the rates would nearly double between 1985 and 1990, going from about 1,900 gal/min to about 3,400 gal/min, and, thereafter, would decrease to about 1,300 gal/min in 2005. Figure IV-7 shows the estimated maximum extent of the 5-foot drawdown contour resulting from dewatering the eight mines.

The area of drawdown shown in figure IV-7 represents the worst-case situation. It is based on the assumption that maximum seepage at each mine would occur at the same time. Because of scheduling differences, it is unlikely that this would happen. For example, pit seepage at pit No. 2 of the Fort Union mine would be greatest about the year 2014. By that time, the Wyodak mine would be the only other mine in operation.

The mines would use an average of about 1,590,000 gal/d of water. About 300,000 gal/d of this would be used for drinking, sanitation, and cleaning equipment. The rest would be used for dust control. Some of the water for dust control would come from pit seepage and, at some mines, from shallow wells in the scoria. The remaining water requirements would be supplied from wells in the Fort Union Formation, at depths of 500 to 1,500 feet below the base of the coal, or from wells in the underlying Lance and Fox Hills Formations.

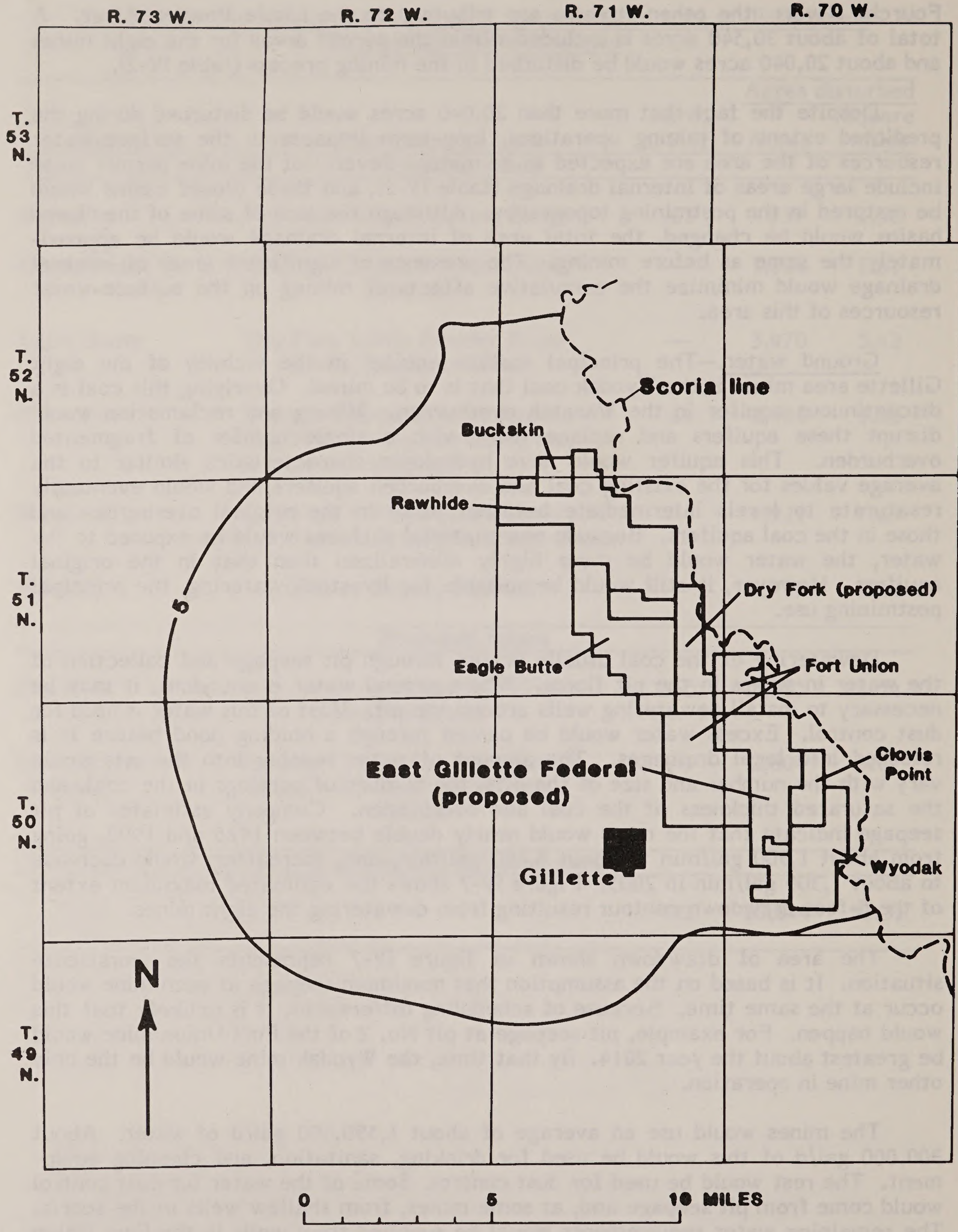

Figure IV-7.--Cumulative 5-foot drawdown of the coal aquifer owing to mining in the Gillette area. (Contour is a composite of life-of-mine worst-case contours estimated for the individual mines.)

Records collected at the Wyodak mine show that the water level in the Fort Union aquifer about 500 feet below the coal has been declining about 5 feet per year. This rate of decline probably would increase as more wells are completed in the aquifer. However, the potentiometric surface is still several hundred feet above the top of the aquifer. Therefore, the aquifer would not be damaged by additional pumping, and the only impact would be increased pumping lifts.

At least five of the mines would obtain some of their water from shallow wells in the scoria. Because the scoria generally has high transmissivity and storage characteristics, the impacts from this pumping would not extend far from the mines. Withdrawal of sizeable quantities of water may affect discharge from scoria-fed springs, but such usage is not expected. Any such depletion of flow to Dry Fork Little Powder River would be replaced by discharge of excess pit water from some of the mines.

During the course of mining, about 150 wells would be removed, and the water levels would be lower in about 200 more. Many of these wells were installed by the coal companies for monitoring. Privately owned wells, in which water has been affected by contamination, diminution, or interruption due to mining, would be replaced by the responsible coal company.

Alluvial valley floors.--About 500 acres of AVF are included within the permit areas for the eight existing and proposed mines in the Gillette area. Additional areas of AVF occur along Donkey Creek, Dry Fork Little Powder River, and Rawhide Creek. Only a small amount of the areas of AVF would be directly disturbed by mining. The essential hydrologic functions of all the areas of AVF would be maintained or restored.

G. VEGETATION

Disturbance of vegetation on the minesite would have a major short-term effect during mining, owing to loss of the land's productive capability. Only a minor long-term effect would exist after mining and reclamation are completed. The proposed mine would progressively remove the vegetation on 2,604 acres during the 28 years of construction and mining. However, this would not conflict with the anticipated long-term regional land uses. A diverse, effective, and permanent vegetative cover would be established on disturbed areas within several years after reclamation is completed. No plant species listed or proposed for listing as threatened or endangered have been documented on the permit area.

Site-Specific Effects

Mining activities would progressively remove and replace vegetation on about 2,604 acres, thus affecting livestock grazing and wildlife habitat. According to the East Gillette Federal mine PAP, the disturbed areas would be rehabilitated with a mixture of mostly native grasses and shrubs. Ultimately, the area would be reclaimed for livestock grazing with provision for wildlife habitat.

Vegetation would be removed from 2,604 acres on the mine and support facilities area during the 28-year life of the mine. Short-term impacts associated with vegetation removal during the construction and operation phases consist of increased erosion, loss of summer range for cattle, and loss of wildlife habitat--principally winter range for deer. Should reclamation of the site fail, potential long-term impacts consist of a degradation of livestock and wildlife forage quality and yield, higher than normal levels of erosion, and undesirable species invasion.

A maximum of about 1,000 acres of the permit area would be disturbed and removed from livestock production at any one time where reclamation is not completed. Grazing restrictions during mining and revegetation could increase this to as much as 100 percent of the permit area. An average of about 80 acres of new surface disturbance per year would occur simultaneously with the revegetation of about an equal acreage each year.

Productivity of a normal upland rangesite typical of the minesite in excellent condition is about 0.3 animal unit months (AUM's) per acre in the Gillette area. Strip mining causes temporary losses of forage production, even if the disturbed rangelands are reclaimed quickly. It is generally estimated that 5 years of forage production would be lost from a rangeland site which is disturbed and subsequently reclaimed. The 2,604 acres proposed for disturbance could produce about 781 AUM's if in excellent condition. A maximum of 300 AUM's would be lost each year during mining at the East Gillette Federal mine. Additional forage production losses of 231 AUM's per year would also occur from about 770 acres occupied by haul roads, overburden and topsoil stockpiles, railroad loops, and surface facilities, for a total maximum loss at any one time of 531 AUM's.

It is estimated that the entire disturbed area would be returned to a state of equivalent or better forage production within several years of cessation of mining. The reestablished vegetation should be dominated by species found in the permanent seed mixtures, most of which now occur on the permit area. Additional species from surrounding areas and direct-hauled topsoil would gradually invade the reclaimed areas and become established on the reclaimed land. Two permanent seed mixes would be used on reclaimed areas: (1) a native rangeland mix of grasses and big sagebrush for upland areas and (2) a mesic mix, which incorporates rabbitbrush and silver sagebrush into the native rangeland mix, to be used along drainageways. Small riparian zones near six small impoundments would be planted with willow and cottonwood seedlings.

Increased levels of erosion and undesirable plant species invasion are likely and normal on disturbed areas prior to the successful establishment of the intended revegetation species. The applicant's proposed revegetation plan would minimize erosion on newly seeded areas through mulching and the use of cover crops. Weed infestation would be controlled as needed. The applicant would use diverse and predominantly native species of the appropriate seasonal variety, as well as replacement of topsoil and creation of a mosaic of shrub and tree plantings, to reestablish the premining land uses of livestock grazing and wildlife habitat.

Reclamation potential in the Gillette area is fair. In a study of the Powder River Basin, Toy and Munson (1978) emphasize that the distribution of precipitation during the growing season is of paramount importance in achieving successful revegetation. Using data from the weather station Gillette 2E, Toy and Munson show a mean growing season (frost-free period) of 120 days and a mean annual precipitation of 16.7 inches with a standard deviation of 1.7. They point out that there are two peaks in distribution of precipitation, April to June and September to October, and state:

> "The April-June period of maximum precipitation, coupled with available snowmelt, should provide the moisture necessary for plant growth

> during the critical initial revegetation period of the growing season. * * *The period of low precipitation in July and August may cause problems in revegetation* * *as this is also a period of maximum potential evapotranspiration. Irrigation during this period would result in better than normal moisture conditions and enhance the probability of successful revegetation."

Toy and Munson also report that the Environmental Studies Board of the National Academy of Sciences, and National Academy of Engineering (1974), suggests that areas receiving 10 inches or more of annual precipitation can be rehabilitated. There is a less than 5-percent chance of the precipitation in any year being less than the annual mean minus 2 standard deviations. For the weather station Gillette 2E this is 16.7 - (2)(1.7) = 13.3 inches, considerably more than 10 inches.

Cumulative Effects

As noted in table I-1, the East Gillette Federal mine and seven mines located within a 5-mile radius of it have permit areas totaling about 30,540 acres. An average of 70 percent of this acreage would actually be disturbed during the life of the mines and about one-half of the total disturbance would be affected at any one time. Thus, about 10,690 acres would be unreclaimed at any one time.

A review of vegetation data and maps presented in the Eastern Powder River coal EIS (Bureau of Land Management, 1979a), a regional analysis of coal development, indicates that the eight mines are located predominately in the big sagebrush and greasewood/saltbush vegetation types. One mine is partially located within riparian lands. Regional vegetation types and acreages are noted in table IV-3. These regional data suggest that mining would affect those vegetation types that cover extensive acreages within the region. Thus, only 10,690 acres (0.2 percent) of the 4,978,560 acres in the region would be affected by the eight mining operations at any one time and most of that is the big sagebrush/grass type. Most of the surface disturbance would occur in three vegetation types: grasslands, sagebrush grassland, and scoria grassland. All eight mines plan to restore the first two types to more or less their premining extent. However, the scoria grassland type would usually not be reestablished on these mine areas. Grasslands associated with scoria burn are slope- and soil-dependent; with the postmining topography of the areas being more level and the soils being of better quality, this type of reestablishment would be difficult. Although relatively unimportant for forage, the scoria grasslands can be important mule deer habitat.

The less extensive vegetation types common to the region (e.g., riparian, cropland, and pastureland communities) would be restored during reclamation. The shrub and tree component of any revegetated community would take the longest to return to premining conditions. Replacement of mature trees with seedlings or saplings would, over the short term, result in a reduction of potential nesting sites for raptors and other bird species. Shrub cover and forage value would increase gradually. Over longer periods of time, species reinvasion on reclaimed lands should largely restore the species and community diversity on these lands to premining levels. Only the scoria-dependent upland grassland type may decline from premining levels (11 percent of permit area), because of the lack of segregation of this substrate material during mining and reclamation.

Table IV-3.--Major vegetation types within Campbell and Converse Counties

(Source: Bureau of Land Management, 1979a)

Vegetation community	Acreage
Playa grassland	250
Scoria grassland	27,300
Sandhill grassland	90,100
Big sagebrush/grass	4,188,150
Silver sagebrush	36,900
Greasewood/saltbrush	82,960
Ponderosa pine forest	328,400
Riparian	224,500
Total	4,978,560

For additional discussions of the cumulative impacts of energy-related development in the eastern Powder River Basin on vegetation see the BLM's regional EIS's (Bureau of Land Management, 1974, 1979a).

H. WILDLIFE

Short- and long-term impacts on fish and wildlife are expected to be moderate, even though the wildlife habitats would be substantially disturbed over the 28-year life of the East Gillette Federal mine. Habitats would be disturbed in incremental parcels averaging 80 acres each year, with about 1,000 acres being disturbed at any one time; reclamation goals include restoration of wildlife habitats. There would be a time lag before newly revegetated lands mature to a stage where food and cover values approach premining capabilities. Grass cover and production would be established quickly, whereas shrub and tree cover and production would take several years to provide maximum benefits. However, there are no special or unique wildlife habitats on the project area to be affected.

Secondary impacts of the mine may be equally or more important than direct habitat disturbance. As mining progresses, additional people may be attracted to the area and their demand for housing, goods, and services may result in offsite losses of habitats. The amount of influx caused by the East Gillette Federal mine would depend on when mining is initiated and the number of people already in the area but currently unemployed. Increased vehicular traffic would result in more road kills, while additional outdoor recreation would lead to more harrassment, illegal harvest, and indiscriminate shooting of wildlife.

Site-Specific Effects

As parcels of habitat are disturbed, mobile species would be displaced to adjacent areas while the least mobile species would be destroyed. Displaced animals do not simply move into unoccupied habitat or into adjacent occupied areas. Rather, wildlife populations fluctuate around a limit determined by food and cover availability. Since adjacent habitats would already be occupied, displaced animals would be forced to compete for limited food and cover, resulting in more intense use of these resources and some losses. As reclaimed areas mature, the surrounding wildlife populations would begin to utilize these lands and numbers would increase. The conversion of crested wheatgrass pasture and cropland to rangeland would benefit most wildlife species, including nongame species that thrive in disclimax or seral situations.

A discussion of the significance of these changes on the various groups of wildlife is presented below. Where applicable, the proposed mitigation measures to reduce any adverse effects are discussed.

Large mammals.--In addition to displacement of mule deer, there would be the long-term effects resulting from the loss of features preferred by mule deer. These include the loss of shade provided by the windbreak of trees and a reduction in the steeper slopes near Reservoir No. 1 located in sec. 8. However, mule deer have proved to be very adaptable around active mines throughout the west. Deer adjust to nonthreatening noise and activities and are often attracted to newly reclaimed areas during certain seasons to feed on young plants and new growth. The limited and no-hunting policy for the mine creates a refugelike situation that deer adjust to and take advantage of quickly.

Like the mule deer, the pronghorn would be displaced as mining proceeds. Long-term effects would be the reduced cover and production of sagebrush on the site, but this is most important during winter when pronghorn use of the site is lowest. Pronghorn have demonstrated adaptability to mine activities and are often observed near facilities and machinery, owing to the refugelike conditions previously mentioned.

The effects on mule deer and pronghorn would not be significant and a number of mitigation measures would be implemented as follows. The revegetation plan would incorporate grasses, forbs, and shrubs beneficial to deer and pronghorn. Furthermore, these plants would be distributed to simulate premine interspersion and edge effect. Fences associated with the mine would be designed for passage of deer and pronghorn except in dangerous areas or on newly revegetated areas. Kerr-McGee would cooperate with Wyoming GFD to minimize poaching and impose speed limits to reduce road kills.

Small mammals.--These species would be displaced and subject to direct destruction because of their burrowing habits and lesser mobility. Most adverse effects would be short-term and minor, since reclaimed areas are invaded rapidly and the reproductive potential of these species is very high. The Kerr-McGee plan to place boulder piles every 40 acres would create shelter and enhance microclimate diversity so valuable to these species.

Other mammals.--Most of these species are mobile enough to avoid direct destruction and would move to adjacent areas where they would be forced to compete for available resources. As a result, the local population would suffer minor reductions until reclamation restores suitable food and cover. The reclamation plan would restore habitats similar to premining conditions, but those with trees and shrubs would take several years to reestablish their premine functions. Boulder piles and protected cover around impoundments would mitigate impacts on these species. Since small mammal populations expand rapidly on reclaimed lands, carnivorous species such as coyotes and foxes would respond accordingly.

Raptors.--At this time, none of the documented raptor nests is scheduled to be disturbed by mining. (See appendix C.) As a standard permit condition, Kerr-McGee would be required to work with the U.S. Fish and Wildlife Service to develop mitigation plans prior to disturbing any raptor nest. Since prey species for raptors would suffer minor impacts, there would be short-term effects on raptors themselves. However, these effects would be minor, because raptors hunt over large areas and reclaimed lands often support higher densities of small mammals than the premine conditions. Raptors have shown greater tolerance to mine activities than expected, with birds hunting and even nesting in close proximity to facilities. Powerlines would be safe for raptor use as perch sites, an important factor since trees are rare in the project area.

Game birds.--Owing to their limited use of the site, these birds would not be significantly affected by the East Gillette Federal mine. Reclaimed areas would be used by doves soon after revegetation. In the case of waterfowl, Kerr-McGee's plan to protect vegetation around impoundments from livestock abuse should enhance the site's value for these birds.

Other birds.--Songbirds would be displaced temporarily into adjacent habitats, but would move into reclaimed areas rapidly, although the species composition might differ according to the new extent and arrangement of vegetation types.

Migrant and resident shorebirds would probably make use of sediment ponds when water is available. Impacts on all of these species would be short-term and minor.

Herptofauna.--These species, while not abundant, would suffer the most direct mortality since most would not be able to escape land clearing and topsoil removal operations. The reconstruction of aquatic habitats and placement of boulder piles would restore values for herptofauna. Use of such features would take longer than for most species, owing to the previously mentioned lack of mobility. These changes would be important on a local basis only.

Fish.--Unless a decision is made to transplant them, the fish (fathead minnow) in Reservoir No. 1 would be destroyed. However, such a loss would be insignificant and reconstructed impoundments could be considered for fish stocking if deemed important or desirable.

Threatened and endangered species.--Based on available evidence, OSM has determined that species protected by the Endangered Species Act would not be affected by the East Gillette Federal mine. The U.S. Fish and Wildlife Service concurred with this determination. (See appendix C.) This conclusion is based on the facts that there are no prairie dog colonies for ferrets, habitat disturbance would not affect the occasional migrant peregrine, and winter use of the site by bald eagles is infrequent and limited. Bald eagles range over large areas and feed as opportunity allows during the winter on live prey and carrion. There are no known roosting or feeding areas for bald eagles on or adjacent to the proposed minesite.

Cumulative Effects

The cumulative effects of habitat disturbance would affect a small percentage of the region's habitats. Mitigation would restore various habitats for the area's wildlife. Since techniques for shrub establishment have not been perfected, the cumulative impact would create grass-dominated habitats favoring species associated with such grasslands. This would result in a wildlife species composition change in those areas previously dominated by shrubs. There are no unique wildlife habitats to be affected, although valuable features, such as rock outcrops, playas, and riparian cover, would be simulated to the extent possible. Emphasis on raptor protection has been and would be carried out on a mine-by-mine basis in consultation with the U.S. Fish and Wildlife Service. Secondary impacts would result from increased human population with associated needs for housing, services, and recreation. These impacts are less controllable than those resulting from onsite mine activities.

I. LAND USE

Mining operations could have a moderate effect on local land-use patterns, because the operator may preclude grazing on as much as 100 percent of the permit area at any one time. This would hinder wildlife use during the mine life. Within several years after initiation of each reclamation phase, rangeland and wildlife use would return to near premining levels. The mine would have negligible effects on regional land-use patterns. Cumulative impacts of coal mining in the eastern Powder River Basin would include a reduction in livestock production over approximately the next 50 years. The mine would affect oil and gas production to an indeterminant extent over the life of the mine.

Site-Specific Effects

The greatest effect on land use would be the removal of 2,604 acres of grazing, pasture, and wildlife habitat lands from use over the life of the mine. While no more than 1,000 acres would be out of production at any one time, land management may require that livestock use be excluded from the entire permit area. At 0.3 AUM's per acre, this amounts to 300 AUM's lost annually. Most of this land is grazingland, and would be returned to grazingland following reclamation. The 651 acres of pasture, which are scattered within the grazingland, and the 34 acres of dryland farming would also be restored as grazingland. This change has been approved by Wyoming GFD and the City of Gillette (appendix E). No prime farmlands exist on the permit area.

The stock ponds and water wells in the permit area would be destroyed and would have to be replaced. Oil and gas production in the area is expected to end by about 1990. Therefore, most of the wells on the permit area would be exhausted, plugged, and abandoned prior to mining. However, an undefinable but probably small amount of oil production would be lost.

The Fox Park subdivision at the southwest corner of the permit area would be affected by noise and dust from mining during years 22 to 24. (See the "Seismic Activity" section of this chapter.) However, no mining would occur closer than 300 feet from the subdivision boundary. No mining would occur within half a mile of the Collins Heights subdivision.

Cumulative Effects

Cumulative impacts resulting from mining at the eight coal mines within the general area include a reduction of livestock grazing and revenues, a reduction of habitat for wildlife (particularly antelope and mule deer), disruption of oil and gas development, and loss of access to the public lands used by recreationists (particularly hunters). In addition, several miles of existing pipelines, telephone lines, and power-distribution lines would require relocation during mining.

Beyond the 30,540 acres of land disturbed by the eight mines, additional land would be disturbed by facilities such as access roads, railroad spurs, and power-transmission lines. New fences would affect livestock and big game movement. Roads and railroads would affect grazing boundaries and access routes.

Most of the area adjacent to the permit area is rangeland or other coal mines. The use of this land would not be affected by the East Gillette Federal mine. Essentially, all of the adjacent mines occur on grazingland and wildlife habitat. Their reclamation plans call for the return to the same uses following mining. Therefore, in the short term, there would be a moderate reduction in grazingland, but the long-term effect would be to return these lands to their original uses.

J. TRANSPORTATION

Vehicular traffic and an at-grade haul-road crossing on Garner Lake Road would create moderate impacts during mining. Negligible effects would result from relocation of several powerlines and pipelines now crossing the permit area.

Increased coal-train traffic would create only a slight increase in the cumulative train traffic effects being experienced in some communities.

Site-Specific Effects

Access to the East Gillette Federal mine and the adjacent Clovis Point mine would be over the Garner Lake Road. There would be a moderate increase in traffic over this county road if both mines were in full production simultaneously. Assuming that no one shared rides, this could result in an many as 449 cars per day of employees only, exclusive of visitors and service vehicles, going to and from both mines over the access road.

During the 15th year of mining in sec. 6, 170-ton trucks hauling coal to the processing plant in sec. 8 would have to cross Garner Lake Road at grade. This would cause delays in other traffic and a possible increase in accidents. A stoplight and barricade at this crossing is proposed to mitigate some of the adverse impacts.

Transportation of the coal from the East Gillette Federal mine would eventually require a maximum of 24 round trips of unit trains per week. (A unit train consists of 110 cars of 100-ton capacity each.) This would result in an increase in rail traffic during the life of the mine, with attendant problems of traffic congestion, air pollution, fuel consumption, noise, and increased chances of derailments and car-train accidents.

The coal underlying the corridors containing Interstate 90, U.S. 14/16, and the Burlington Railroad would not be mined. Where mining equipment must cross these corridors, underpasses would be used. The underpasses would be designed to meet Federal highway and railroad standards.

Several powerlines, ranging from 14.4-kV to 230-kV, crossing the proposed permit area would require rerouting or protection. The applicant proposes to reroute two powerlines adjacent to U.S. highways in corridors that would not be mined. Another powerline would be rerouted temporarily around active mining areas, and there would be no permanent adverse effect as the line would be replaced on the regraded topography. Powerlines would have to be constructed to the areas to be mined to provide power for the plant, facilities, and the electric-powered shovels and drills. The location of these lines would change as mining advances, and none would be permanent.

The three natural-gas pipelines and two wastewater pipelines that cross the proposed permit area would have to be relocated to permit mining. The relocations would involve about 2 miles of gas pipelines and about 4 miles of wastewater pipelines. The lines are to be relocated to proposed buffer zones and highway corridors. Any impact on the service provided by these lines would be minor and of short duration.

Cumulative Effects

The mining and resultant increased road use in the general area would have several general adverse effects. These are increased road-maintenance costs, increased noise, increased gasoline and motor-fuel consumption, increased animal road kills, and decreased air quality.

Most of the coal being mined in the eastern Powder River Basin at present is being shipped east or south of Wyoming, and it seems likely that this would be the case in the future. It is not anticipated that the East Gillette Federal mine would increase rail traffic in Gillette as the railroad spur serving the mine joins the east-west mainline several miles east of the city. However, regional and interregional rail traffic impacts may become significant.

The Burlington Northern mainline between Sheridan, Wyoming, and Lincoln, Nebraska, has had a rapid growth in the amount of coal train traffic in recent years. Officials of communities along the Burlington Northern mainline have identified highway traffic delays at grade crossings as the most significant problem resulting from this increased traffic. Communities that have developed around the railroad tracks are temporarily severed by passing trains if they do not have grade separated crossings. Communities with insufficient grade separated crossings find that traffic levels on the ones they have increase as motorists alter their routes to avoid blocked grade crossings. In both cases, traffic delays create an incon venience to local residents and, more important, may delay the provision of essential community services such as police, firefighting, or medical aid.

The extent of adverse effects depends on the frequency of train traffic, the length of the train, the train speed, and the time of day. Unit trains normally are somewhat over a mile in length and take about 3.5 minutes to pass a particular point at 20 miles per hour. If the speed slows to 5 miles per hour, as it often does near inspection, maintenance, or classification yards, the train takes approximately 13 minutes to pass a point. Shorter delays would occur in undeveloped areas where the train's speed can increase. Warning devices and automobile-driver hesitation also extend the amount of time a particular crossing is closed. Under normal circumstances, train movements would be spread throughout the day. Therefore, blockages normally would be limited to a maximum of 10 to 15 minutes at any one time. Depending on the time of day (rush hour vs. late night), the effect of the rail traffic at crossings would vary.

Related to delays at grade crossings is the occurrence of accidents at grade crossings. These would increase as train frequency increases. Every grade crossing is different, so generalized estimates cannot be related to an individual crossing. However, estimates can be made for a typical crossing. A typical crossing protected by flashing lights with 1,000 motor vehicles and 10 trains per day could be expected to be the site of an accident 0.01 times per year (once every 100 years). At 25 trains per day this would increase to 0.03 times per year, and at 50 trains per day it would increase to 0.06 times per year (Schoppart and Hoyt, 1968), or 6 times the expected occurrence with 10 trains per day.

Impacts resulting from rail operations would be concentrated within, but not confined to, the region; rather they would be manifested, to a lesser degree, wherever the coal shipment goes. The impacts discussed previously would pertain to rail movement regardless of routing. Areas affected would not be subjected to new impacts, but the levels of existing impacts would increase. As discussed, the effect of an individual train probably would not be significant. It is the repetition of these otherwise insignificant impacts that may become significant.

K. RECREATION

Impacts to recreation would be minor. The present hunting on the minesite would be eliminated during construction, mining, and reclamation. Dispersed recreation would increase in Campbell County.

Site-Specific Effects

The proposed mining operation would disrupt established patterns of recreational activities on privately or State-owned land in the mining-plan and adjacent areas. The plantsite, transportation facilities, and annual mining operations would physically eliminate up to 1,000 acres of potential hunting area per year throughout the 25 years of mining. The acreage withdrawn from recreational hunting by the company for safety reasons, regardless of habitat characteristics, would be appreciably larger, but it cannot be predetermined because it depends on the extent of the protection the mining company might give to mine personnel and equipment, and to the lands being reclaimed.

Mining would cause the short-term loss of approximately 18 acres of waterfowl and fish habitat, as well as the recreational use of these resources.

Because of the high public interest being given to other coal mines in the region and the proximity of Interstate 90 to the East Gillette Federal mine, sightseeing would increase. Sightseeing would be a major recreational activity for the permit area for the life of the mine.

Cumulative Effects

Campbell County's public recreation facilities are among the more extensively developed in the Rocky Mountain region. Usage by young, recreation-oriented inmigrants continues to be high. The strong financial position of the county recreation program appears to assure future recreation opportunities for area residents irrespective of the development of the East Gillette Federal or any other future mine.

During mining, hunting use on the 30,540 acres affected by the eight mines would moderately reduce the regional ability to support hunting. In the long term, hunting use would return to the reclaimed areas. Long-term recreational use of the Big Horn, Black Hills, and Medicine Bow National Forests, the Glendo Reservoir and State Park, and the Keyhole Reservoir and State Park would increase.

L. CULTURAL RESOURCES

Adverse impacts to significant cultural-resource sites on the East Gillette Federal mine permit area have been mitigated. Thus, mining activities would have a minor effect on recorded cultural resources.

Site-Specific Effects

Wyoming DEQ, Land Quality Division, Rules and Regulations, Chapter II, Section 2.1.(1)(k) (1981) requires an evaluation of mine permit areas to determine if significant "artifacts (and) fossils or other articles of cultural, historical, archeological or paleontological value exist thereon." The National Historic Preservation Act of 1966, as amended in 1980, Executive Order 11593, and 36 CFR 800.4 require an inventory of all cultural resources that are (1) listed or eligible for listing on the National Register of Historic Places and (2) situated on lands that are or are proposed to be federally permitted or licensed. Mitigation of any adverse impacts to such cultural resources is required.

The data collected during inventory and testing of all located cultural resources effectively mitigate the adverse effects caused by proposed land-disturbing activities except to the Carter/Kerr-McGee Bison Trap (48 CA 12), a National Register eligible site. Extensive excavation of this paleo-Indian site constituted effective mititgation of the adverse effects. The applicant has indicated that it will provide for the protection of unanticipated finds located during mining and for the monitoring of removal of topsoil in archeologically sensitive areas.

Cumulative Effects

A majority of the recorded cultural resources in the Powder River Basin have been reported as a result of studies associated with energy development. Though less work has been conducted in the East Gillette Federal mine area of the basin, where somewhat lower densities of sites, compared to the south, are, for the most part, to be found, it is clear that a number of sites eligible for nomination to the National Register of Historic Places have been or will be impacted by coal mining operations.

Cultural resources located within the region may be impacted as a result of increased population in the general area. There may be increased vandalism and unauthorized collecting associated with recreational activity and other pursuits facilitated by easier land access as a result of mining operations. Moreover, there is always a possibility that cultural-resource inventories based on current technology may not have located all significant sites or data within the survey boundaries. Therefore, the potential exists of destroying unknown sites.

The study of cultural resources has benefited and will benefit from coal development. Valuable data are being and have been collected during various surveys. Data that would otherwise not be collected until some time in the future or lost in the interim are available for study. Mitigation of site impacts also results in the collection and preservation of data that would likely otherwise be lost.

The cumulative effects of mining on important cultural resources in the northern part of the Powder River Basin must be considered significant. However, when mitigation is accomplished, the impacts on known cultural resources are greatly lessened.

M. VISUAL RESOURCES

During construction and mining, visual impacts would be major because the minesite is visible from major travel routes. The facilities area would be partly concealed by surrounding hills. The landscape character would be moderately changed after reclamation is completed, owing to a change in topographic elevation.

Site-Specific Effects

The most significant impacts to visual resources of the immediate vicinity of the East Gillette Federal mine would be the unnatural lines of the open pit, the service roads cut into hillsides, and the unshaped overburden, all of which would strongly contrast with the natural rolling hills. Secondary impacts would be the changes in landscape resulting from the introduction of red scoria service roads, exposed black coal beds, and varied colors of the overburden. The contrast between the varied landforms created by mining and the surrounding hills would be made more evident by the absence of vegetation and the vertical walls of the pit.

The introduction of structures to the mined area would add further contrasts in form, line, color, and texture. For example, the presence of silos and the movement of haul trucks and loaders across the area would introduce a change that, for the purpose of managing natural resources, would impact the setting--despite a recreational interest to the highway traveler. Powerlines crossing the permit area to the plantsite would exert some influence in form and lines.

Cumulative Effects

During mining, the principal visual impact from the eight area mines would be the visibility of the mine pits and facilities areas. Facilities areas at the eight mines are located several miles apart, except for those at the East Gillette Federal and Clovis Point mines, and far from major visual vista points. Anyone likely to see the facilities would either be passing through the immediate mine area or visiting on mine-related business. Except from the air, it would probably not be possible to see either the pits or the facilities of more than two mines from any one spot. Thus, any cumulative impacts to visual resources of the area during mining would be insignificant.

After mining, the reclaimed slopes would be smoother than premining slopes; there would be fewer gullies than at present. Even so, the landscape of the reclaimed mines would look very much like undisturbed landscape in the area in terms of line, form, color, and texture.

N. SEISMIC ACTIVITY

Environmental effects of blasting operations in the vicinity of the proposed mine would be minor. Observations at other surface coal mines in the area indicate that wildlife adapt to noise and ground vibration associated with blasting operations. Flyrock would not be excessive and would not be a threat to humans or animals outside of the cleared blast area.

Site-Specific Effects

The greatest hazard associated with surface-mining blasting comes from excessive and uncontrolled flyrock. Flyrock results when the force of the expanding explosive gases within the overburden or coal is much greater than the cohesive force of the overburden or coal to contain the expanding gases (known as Rosenthal's conjecture). The amount of flyrock is directly related to poor blast design and stemming practices. The 10 to 15 feet of stemming which is proposed for the East Gillette Federal mining operation would contain flyrock to within 150 feet of the blast. The blast area would be cleared within a 500-foot-radius safety zone prior to blasting. This flyrock would fall no closer than 350 feet from any residential dwelling.

Blasts are initiated by means of a hand-held device. Should humans or animals enter the site after the blast area has been cleared, the blast sequence can be delayed until the area is once again cleared and safe for blasting.

When explosives are detonated within coal or overburden, there occurs permanent deformation and fragmentation of the material in the immediate vicinity of the blast hole. This is usually not more than ten blast-hole diameters (approximately 100 inches) from the blast center. From this point, the blast effect is in the form of a seismic wave which radiates away from the site of the blast. The seismic wave would decay with distance, and its intensity would be directly related to the amount of explosives detonated per delay period.

The blasting operations on the mine would not produce vibrations in excess of 0.30 inches per second at the closest structure not owned and/or occupied by the operator. Vibrations of this type are not capable of causing damage to structures but are perceptible to humans and animals.

Blasting operations at Kerr-McGee's adjacent Clovis Point mine began in February 1978. All blasts at this mine have been monitored using a three-directional particle-velocity recording seismograph. None of the 791 blasts to date generated a vibration in excess of 1.0 inches per second at the closest man-made structure, which is owned by the mine operator (J. Olsen, oral communication, November 2, 1983). Vibrations at residential dwellings would be much less, because of the distances involved and the associated attenuation of the vibration.

Blast-induced vibrations would be much greater at distances closer to the blast site, but would not be capable of causing permanent ground deformation.

The greatest contribution to airblast is from the stemming-released pulses, which are generated by the blowout of the stemming and escaping gas from the borehole. The amplitude of airblast resulting from this pulse increases as the stemming length decreases.

Current and proposed blast design and loading practices, coupled with the use of a noiseless surface delay and initiation system, would result in airblasts which would not exceed 100 dB. The duration of this airblast would be no more than 3 seconds.

Cumulative Effects

The only time there would be a cumulative blast effect from nearby mines would be when all the mines in the area detonated their blasts at exactly the same time. Even under these conditions, the distances between the various mines and the attenuation of airblast and vibration with distance would preclude an adverse impact. There would be an increase in the number of total blasts from all mines with the number being dependent upon the rate of coal production and overburden removal. One could expect from 1 to 20 blasts each day from the eight existing and proposed mines in the area.

O. SOCIOECONOMICS

This section discusses only those socioeconomic variables which would be adversely affected by the proposed action or the cumulative mining activities and is based on a report by Tetra Tech, Inc. (1983). All socioeconomic variables and project effects are noted in table IV-4. Should the Secretary approve the mining plan and issue a Federal permit, Kerr-McGee could delay commencement of its mining and reclamation operation for 3 years in accordance with 30 CFR 786.25(b)(1). If such a delay resulted in the commencement of operations at the East Gillette Federal mine at the same time other new mines opened and production at existing mines increased, the cumulative impact of all these mines taken together to the socioeconomic environment of the City of Gillette and Campbell County could be more adverse than if Kerr-McGee commenced operations shortly after issuance of the Federal permit. The discussions under the "Site-Specific Effects" and "Cumulative Effects" subsections below assume implementation of the preferred alternative and no delay in commencing operations by Kerr-McGee after permit issuance. A discussion of socioeconomic effects under the delayed-mining case is presented in the "Site-Specific and Cumulative Effects of the Applicant Delaying Commencement of Operations" subsection.

Employment and population increases resulting from development of the East Gillette Federal mine would be minor. All public services except mental-health care and wastewater treatment would accommodate this project-related population. No adverse effects to water systems, solid waste disposal, parks and recreation, library facilities, or electric power would occur.

Cumulative employment and population increases would be slight and would affect mental-health care, law enforcement, and possible wastewater treatment.

If project start-up is delayed several years, the socioeconomic consequences could become major since the East Gillette Federal mine could begin operation as existing and proposed mines increase their production. In the delayed-mining case, major impacts could be evident on a project and cumulative basis.

Site-Specific Effects

Employment.--Project-related construction employment would peak at 264 in 1985 (table IV-4). Total employment at the East Gillette Federal mine would peak at 728 in 1988. Employment increase as a result of the project would amount to 1.3 percent of the baseline employment in 1985 and 3.3 percent in 1990.

Population.--Without the East Gillette Federal mine, Campbell County population would increase at an average rate of 2.4 percent and would reach a 1990 population of 40,000; with the East Gillette Federal mine, an additional 1,310 persons would be added to the 1990 population. Most of this growth would be near Gillette. The city would grow to 23,500 in 1990, including 1,245 persons added as a result of the project (table IV-4).

Personal income.--Without the mine, personal income in Campbell County would increase from $461.0 to $552.0 million between 1985 and 1990. With the mine, personal income would increase from $494.6 to $572.6 million between 1985 and 1990, representing a 3.7-percent increase in total personal income resulting from the operation of the East Gillette Federal mine. Per capita income without the mine would increase from $12,560 to $13,810 during this same period. Per

Table IV-4.--Summary of projected socioeconomic changes in Campbell County, Wyoming, 1985, 1988, and 1990 with and without the East Gillette Federal mine

(Source: Tetra Tech, Inc., 1983)

Variables[1]	1985	1988	1990
Direct employment:			
Construction	120	0	0
Operation	0	331	331
Total	120	331	331
Total employment (Campbell County):			
Without East Gillette Federal mine	20,420	21,380	22,250
With East Gillette Federal mine	20,684	22,180	22,978
Net change	264	728	728
Population (Campbell County):			
Without East Gillette Federal mine	36,700	38,400	40,000
With East Gillette Federal mine	37,175	39,710	41,310
Net change	475	1,310	1,310
Population (Gillette urban area):			
Without East Gillette Federal mine	28,200	29,200	30,600
With East Gillette Federal mine	28,650	30,445	31,845
Net change	450	1,245	1,245
Population (City of Gillette):			
Without East Gillette Federal mine	20,500	22,100	23,500
With East Gillette Federal mine	20,840	23,035	24,435
Net change	340	935	935
Total personal income (Campbell County; in millions of 1982 dollars):			
Without East Gillette Federal mine	$461.0	$510.0	$552.0
With East Gillette Federal mine	467.2	530.6	572.6
Net change	6.2	20.6	20.6
Housing requirements (Campbell County):			
Without East Gillette Federal mine	12,010	12,580	13,100
With East Gillette Federal mine	12,165	13,010	13,530
Net change	155	430	430
Housing requirements (Gillette urban area):			
Without East Gillette Federal mine	9,400	9,750	10,200
With East Gillette Federal mine	9,550	10,160	10,610
Net change	150	410	410
Campbell County sheriff's personnel:			
Without East Gillette Federal mine	37	38	40
With East Gillette Federal mine	38	39	41
Net change	1	1	1

Table IV-4.--Summary of projected socioeconomic changes in Campbell County, Wyoming, 1985, 1988, and 1990 with and without the East Gillette Federal mine--Continued

Variables[1]	1985	1988	1990
City of Gillette police officers (full-time):			
Without East Gillette Federal mine	31	33	35
With East Gillette Federal mine	31	34	37
Net change	0	1	2
Volunteer fire personnel (Campbell County):			
Without East Gillette Federal mine	73	77	80
With East Gillette Federal mine	74	80	83
Net change	1	3	3
Daily peak water consumption (City of Gillette; in thousands gal/d):			
Without East Gillette Federal mine	5,892	6,298	6,697
With East Gillette Federal mine	5,989	6,565	6,963
Net change	97	266	266
Daily peak water consumption (Gillette urban area; in thousands gal/d):			
Without East Gillette Federal mine	8,037	8,322	8,721
With East Gillette Federal mine	8,165	8,677	9,076
Net change	128	355	355
Daily peak wastewater flow (City of Gillette; in thousands gal/d):			
Without East Gillette Federal mine	4,700	5,100	5,400
With East Gillette Federal mine	4,778	5,315	5,615
Net change	78	215	215
Daily peak wastewater flow (Gillette urban area; in thousands gal/d):			
Without East Gillette Federal mine	6,500	6,700	7,000
With East Gillette Federal mine	6,604	6,986	7,286
Net change	104	286	286
Sanitary landfill acreage required (Campbell County):			
Without East Gillette Federal mine	5.5	5.6	6.0
With East Gillette Federal mine	5.5	5.8	6.2
Net change	Negligible	0.2	0.2
Acreage required for parks (Campbell County):			
Without East Gillette Federal mine	367	384	400
With East Gillette Federal mine	372	397	413
Net change	5	13	13
Acreage required for parks (City of Gillette):			
Without East Gillette Federal mine	102	110	117
With East Gillette Federal mine	104	115	122
Net change	2	5	5

Table IV-4.--Summary of projected socioeconomic changes in Campbell County, Wyoming, 1985, 1988, and 1990 with and without the East Gillette Federal mine--Continued

Variables[1]	1985	1988	1990
Library volumes required (Campbell County):			
Without East Gillette Federal mine	73,400	78,600	80,000
With East Gillette Federal mine	74,350	79,420	82,620
Net change	950	2,620	2,620
School enrollment (Campbell County School District):			
Without East Gillette Federal mine	7,930	8,430	8,780
With East Gillette Federal mine	8,031	8,718	9,068
Net change	101	288	288
Electric power needs (City of Gillette; in kilowatts):			
Without East Gillette Federal mine	22,550	24,310	25,850
With East Gillette Federal mine	22,924	25,338	26,878
Net change	374	1,028	1,028
Net fiscal impact: revenue surplus (Campbell County; in millions of 1982 dollars):			
Without East Gillette Federal mine	$47.7	$50.0	$52.0
With East Gillette Federal mine	48.3	51.6	53.7
Net change	0.6	1.6	1.7
Net fiscal impact: revenue surplus (City of Gillette; in millions of 1982 dollars):			
Without East Gillette Federal mine	$1,359.2	$1,465.3	$1,558.1
With East Gillette Federal mine	1,381.7	1,547.3	1,620.1
Net change	12.5	62.0	62.0

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[1] For a discussion of impacts on health care, and welfare and social services, see text. Quantitative analysis for these topics was not deemed necessary.

capita income with the mine would increase from $12,568 to $13,861 during the period (an 0.4-percent increase in 1990).

Housing.--Housing in Campbell County would expand by 2,200 units without the mine or about 275 units per year between 1983 and 1990. Growth would take place primarily in the Gillette urban area. Project-specific housing demand would peak in 1988, when 430 units would be needed in the county with the mine (table IV-4).

Law enforcement.--Law enforcement personnel and equipment resources for both the county and the City of Gillette should be adequate without the proposed project; one additional sheriff's patrol vehicle and one additional employee would be required in the county with the mine. Two additional city police officers and one city vehicle would also be needed by 1990 with the mine (table IV-4).

Fire protection.--Volunteer fire fighter needs would be sufficient without the mine. Four new volunteers would be required by 1990 with the mine.

Health-care facilities.--Recent expansion in hospital facilities should be sufficient for project-related needs. Staffing deficiencies in the mental health area could become more serious as a result of mine-induced growth.

Wastewater systems.--Wastewater processing is currently a problem and is likely to remain so in the future with and without the project. Resolution of the problem is possible with proposed but currently unfunded expansion of wastewater facilities in the county.

Education.--Current school capacity in Campbell County should be sufficient for anticipated needs with the East Gillette Federal mine. The ratio of students per household has stablized at 0.64 students per permanent dwelling unit. Assuming that this ratio increases slowly to about 0.67, total enrollments without the East Gillette Federal mine are projected to increase by about 26 percent, from 6,964 in 1982 to 8,780 in 1990. Elementary school enrollments, which are projected to reach 5,751 in 1990, will still be under the current design capacity of 5,808 students. Secondary school enrollments in 1990 are projected to be only about 80 percent of the current capacity of 3,800 students.

Welfare and social services.--Welfare and social services in the county would require one or two additional persons as a result of project-specific growth.

Cumulative Effects

Employment.--While the East Gillette Federal mine would add only 728 workers to the county employment, total employment in the county as a result of all projected or planned developments is expected to increase by 3,968 workers, from 19,010 in 1983 to 22,978 in 1990. This represents an average annual growth rate of 2.7 percent.

Population.--Population growth in the county as a result of East Gillette Federal mine and all other developments would amount to 7,110 persons between 1983 and 1990, representing an annual average increase of 2.7 percent. On an annual basis, the growth rate would range from a decline of 0.3 percent in 1986-87 to an increase of 5.8 percent in 1984-85, when most energy developments in the area are expected to recover from the economic recession.

Personal income.--The county's total personal income would increase from $494.6 million in 1985 to $572.6 million in 1990 as a result of the East Gillette Federal mine and all other developments anticipated during this period. Average annual growth of total personal income during the 1985-90 period would amount to 3.2 percent. Per capita income would increase from $12,568 in 1985 to $13,861 in 1990 with the eight mines and related developments.

Housing.--Cumulative housing requirements generated by the implementation of East Gillette Federal mine and all other projected or planned developments would reach 13,530 housing units by 1990. This amounts to an increase of 23,350 units between 1983 and 1990, generating an average demand for 335 units per year. Building permits issued in the City of Gillette averaged 454 units during the 1976-82 period. At this rate, an average housing demand of 335 units for the county as a whole does not appear to be high enough to create any significant impacts on the housing market.

Law enforcement.--While the additional requirements for law-enforcement personnel and equipment generated by the East Gillette Federal mine are not significant, the cumulative impacts of all developments would be substantial. The county sheriff's department is expected to add seven officers and four vehicles between 1983 and 1989, if current ratios of officers and vehicles to population are to be maintained. Corresponding requirements in the City of Gillette Police Department would be for 10 officers and 4 vehicles by 1990.

Fire protection.--All anticipated projects in the county, including the East Gillette Federal mine, would create a demand for 15 additional volunteers and upgrading or replacement of some equipment by 1990. Plans to construct a new substation and to add to available rolling stock, if implemented, would be sufficient to meet any anticipated needs. Funding for such improvements is not considered a problem as an increasing population would generate increased revenues.

Health care.--The cumulative impacts of all development projects in the county would be several times larger than the project-specific impacts. Hospital facilities and availability of an adequate number of medical personnel are, however, not considered to be problems even with increased cumulative impacts. Funding for mental-health services is already strained and this would create problems in providing an adequate level of services as the demand increases. Population growth by 1990, resulting from all developments in the county, is projected at 21 percent over the 1983 level. Unless new funding sources are found, improvement of existing facilities would be difficult.

Wastewater systems.--In the absence of a 1984 start on the construction of a new sewage plant, the cumulative impacts on the sewage-treatment facilities in the Gillette urban area would be significant. Total wastewater flow is projected to increase by 1.4 million gal/d between 1983 and 1990 in the City of Gillette. The new plant is expected to be able to serve a population of 35,000, whereas the city's population is projected to increase to only about 25,000 by 1990. With such a capacity, it should be able to serve the entire Gillette urban area, whose population is projected to reach approximately 32,000 persons by 1990.

Education.--Cumulative impacts of all anticipated developments in the county on the existing school facilities are projected to be moderate. By 1990, about 1,800 additional students are expected to enroll in county schools. Of these, about 1,180, or 66 percent, are projected to be elementary school students and about 620 secondary school students. While the total excess capacity currently stands at about 2,300 additional students, only one-half of it (1,161 in 1983) is in the elementary schools. Moreover, some of the elementary school excess capacity is in the rural areas of the county. With an increase of 1,180 elementary school students by 1990, some of the schools would most likely face overcrowding or need for expansion. Construction of new elementary school facilities would need to be continued. While the district is currently one of the richest in the State, this situation is likely to level off owing to the school-funding equalization program.

Welfare and social services.--Population increase as a result of all anticipated developments in the county is projected at an average annual rate of 2.7 percent during the 1983-90 period. Welfare and social services would have to be increased at this same rate in order to maintain current standards. The Department of Public Assistance and Public Services is entirely funded by the State of Wyoming; funding would be adequate to meet the county needs. Most of the capital improvements for providing the basic infrastructure have already been made.

Site-Specific and Cumulative Effects of Applicant Delaying Commencement of Operations

It is possible that the construction of the project may be delayed several years. The analysis of impacts below assumes that the construction of the project would be delayed by 3 years, as allowed by 30 CFR 786.25(b)(1). The overall effect of such a delay would be a major increase in the level of impacts on employment, population, housing, and public services should the project start-up coincide with the opening of other new mines and the increase of production at existing mines.

A delay in the implementation of the East Gillette Federal mine would noticeably change the finances of the county, city, and school-district jurisdictions. Intergovernmental revenues in the form of mineral royalties would be delayed with the delay in the project start-up. This loss or reduction in revenue could put an additional temporary burden on the debt repayment scheduling or at least on tightening of the budgets, insofar as these depend on contributions expected to be made by the opening of the East Gillette Federal mine immediately following permit issuance.

Total employment in Campbell County is projected to increase from 20,420 workers in 1985 to 22,250 workers in 1990 without the mine. Total county employment in the mining sector has declined from 4,910 in 1982 to about 4,700 in 1984. Growth in this sector is expected to resume at an average annual rate of 3.8 percent during the 1985-90 period. If a 3-year delay in construction of the East Gillette Federal mine materializes, most of the construction and operations workers currently available due to the 1982-84 economic slowdown would be absorbed by new mines or existing mines that will be increasing production. Thus, the need for worker inmigration from other areas to serve both the Kerr-McGee mine and these other mines would increase. With inmigration, population growth, demand for housing and public services, and public expenditures would also increase. These are considered potentially major impacts; their severity would depend on the number of inmigrants.

P. SAFETY

Injuries would be sustained by workers during the life of the mine. These injuries could range in severity from minor, requiring medical treatment, to permanent, amounting to disability and/or death.

Accident figures for 1983 for the nearby Kerr-McGee Clovis Point mine show that there were 1.87 lost-time injuries through October 1983 for every 200,000 man-hours worked (Dave Richardson, Kerr-McGee Coal Corporation, oral communication, November 3, 1983). The average coal miner works approximately 2,000 hours per year. This would result in an estimated 154 lost-time injuries, based upon a 25-year life of the mine and 331 employees. There have been no fatal mining-related accidents at either of Kerr-McGee's Wyoming mines (Clovis Point and Jacobs Ranch) since Kerr-McGee began coal production there in 1977.

Coal-mining-related accident figures for January through June 1983 for the State of Wyoming, obtained from the Department of Labor (1983), show that there were 2.02 lost-time injuries for every 200,000 man-hours worked. From 1978 to 1983, inclusive, there have been three deaths in Wyoming surface coal mines, or an average of 0.43 deaths per year.

Q. THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The East Gillette Federal mine permit area would be committed to coal production for 25 years, based on anticipated production levels. During this time, mining would result in the introduction of additional roads, railroads, powerlines, fences, structures, and associated human populations into the Gillette area, once semiagricultural but now increasingly dominated by coal mining and oil-and-gas activities. This increase in population would create an increased demand for all public services. Overall, the open, basically treeless landscape would be visibly intruded more by construction and other human activities than by mining excavation and reclamation.

As the coal is mined, almost all components of the present ecological systems would be modified and, in some cases, destroyed. The reclaimed land would be topographically lower, and, although it would have approximately the original contour, it would lack some of the original variety in geometric form.

During construction and operation of the East Gillette Federal mine, there would be a loss of vegetation on 2,604 acres and an accompanying disturbance of wildlife habitat and grazingland. A loss of about 300 AUM's of forage production a year would occur. However, it is estimated that the disturbed areas would be returned to an equivalent or better forage production capacity within several years of initial disturbance. Native grasses and shrubs would be planted so that rangeland would be restored on the reclaimed areas after several years. The reestablishment of mature sagebrush habitat for antelope would occur several years thereafter. Long-term productivity would depend largely on range-management practices.

The use of 180 acre-feet of water a year is not expected to affect other users of water. Some of this water would come from pit seepage. Any lowering of water levels resulting from this seepage is not expected to extend more than a mile from the active pit. The rest of the water required for operations would be obtained from 1,200-foot-deep wells in the Fort Union Formation and from shallower scoria aquifer wells. Only two other wells within 3 miles of the proposed wells are known to obtain water from this depth. Water-level declines caused by pumping or pit seepage would slowly return to normal through natural recharge once the mine is closed.

Mining operations and associated activities would tend to degrade the visual resources of the area on a short-term basis. Following removal of surface facilities and completion of reclamation, the long-term impact on visual resources would be minor.

During the short term, the greatest impacts to recreation values would result from land disturbance and increases in population. The success of reclamation would determine the ultimate long-term recreational use of disturbed areas.

The proposed action would provide employment directly and indirectly to 728 workers and as many as 430 households, thereby enhancing the long-term productivity of the region. However, certain community services and facilities would be strained as demands from increasing populations exceed capacities. In the long term, as local government revenues increase, the economic situation would stabilize at new levels of use and need.

Development of mine operations and ancillary facilities would result in increased rail and highway use to move construction workers and necessary materials to the various construction sites and to transport the coal. All facilities developed for short-term purposes would continue to be used over the long term. Once in place, these facilities (specifically, access roads and the railroad) would serve the long-term transportation needs of the region.

Increased traffic noise and road dislocations related to construction at the mine would be short-lived--2 years. However, operation of the railroad and mines would result in longer-term increases in noise and traffic conflicts, and in esthetic impacts for the duration of operations.

R. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The major commitment of resources is the mining and consumption of 256 million tons of coal to be used for electrical power generation over the 25-year life of the mine. This coal represents about 1.2 percent of the economically strippable reserves of the eastern Powder River coal basin. An additional 31 million tons of coal would be lost owing to current mining-method inefficiencies. Energy, in the form of petroleum products and electricity, would be expended to obtain coal and would be consumed by the increased population.

An indeterminable amount of scoria, which is used for aggregate, would be used in the construction of mine facilities, the railroad loop, and access roads. Scoria deposits mined with the overburden would also be irretrievably lost.

The quality of approximately 6,802 acre-feet of topsoil material would be irreversibly changed. Soil formation processes, although continuing, would have been irreversibly altered by mining-related activities. Newly formed soil material would be unlike that in surrounding unmined areas.

Mining would remove the coal and overburden aquifers within the permit area and replace them with unconsolidated overburden, resulting in a more highly mineralized aquifer that would still be suitable for the postmining uses of grazing and wildlife habitat. No significant changes would occur to the surface-water regime.

Materials such as steel, aluminum, and copper used for the railroad, transmission lines, and in the manufacturing of mining machinery and buildings would be committed for the life of the various projects, but much of it may be salvageable upon abandonment.

Loss of life and disabling injuries would occur owing both to the mining operations and to increased vehicular and train traffic. This would be an irretrievable commitment of human resources.

Any accidental destruction of archeological or paleontological values would be irreversible and irretrievable.

The marginal deer habitat now on the permit area would be reduced in value owing to the change in topography. The forage that the affected land could have produced would be lost during the period of mining and reclamation. Production on rangeland would be lost from approximately 1,000 acres at any one time during the life of the mine.

CHAPTER V

CONSULTATION AND COORDINATION

This EIS was prepared by an interdisciplinary team from OSM. The public is urged to comment on and to make suggestions regarding this draft EIS. In addition, comments are solicited from the following:

Department of the Interior:

Bureau of Land Management
Bureau of Mines
Bureau of Reclamation
Minerals Management Service
National Park Service
U.S. Fish and Wildlife Service
U.S. Geological Survey

Other Federal agencies:

- Council on Environmental Quality
- Department of Agriculture:
  - Forest Service
  - Soil Conservation Service
- Department of Energy
- Department of Health and Human Services
- Department of Housing and Urban Development
- Department of Labor:
  - Mine Safety and Health Administration
- Department of Transportation
- Environmental Protection Agency
- Federal Energy Regulatory Commission
- Interstate Commerce Commission
- President's Advisory Council on Historic Preservation

State of Wyoming:

- Department of Environmental Quality:
  - Air Quality Division
  - Land Quality Division
  - Water Quality Division
- Governor's Clearing House
- Industrial Siting Administration
- State Historic Preservation Officer
- Wyoming Game and Fish Department

Local agencies:

Board of County Commissioners, Campbell County
Campbell County School District No.1
City of Gillette

Applicant:

Kerr-McGee Coal Corporation

Private organizations:

Friends of the Earth
Gillette News-Record
Izaak Walton League, Wyoming Division
National Resources Defense Council, Inc.
Powder River Basin Resource Council
Public Land Institute
Rocky Mountain Center on Environment
Sierra Club
State League of Women Voters, Wyoming
Wildlife Society, Wyoming Chapter

CHAPTER VI

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Foster E. Kirby	Cultural resources	M.A., Archeology, University of Calgary
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David R. Maxwell	Air quality, climate	M.S., Environmental Health, University of Cincinnati
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Jennifer Shawe	Editor	B.A., English, University of Denver
Contractor		
Tetra Tech, Inc.:		
Raj Mathur	Socioeconomics	Ph.D., Economic Geography

CHAPTER VII

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APPENDIX A

THE APPLICANT'S PROPOSAL

The mining and reclamation activities described in this appendix are summarized from the PAP. Approval of the mining plan, with or without conditions developed by OSM and Wyoming DEQ, and issuance of a Federal permit to mine coal is the preferred alternative.

The permit area is an elongate north-south trending strip 1 to 2 miles wide and about 5 miles long (fig. A-1) in T. 50 N., R. 71 W., Campbell County, Wyoming, about 3 miles east of Gillette. Most of the area has internal drainage, with runoff collecting in depressions produced by natural burning of the underlying coal and subsequent collapse of the surface sometime in the geological past. Interstate 90, U.S. 14/16, and the main line of the Burlington Northern Railroad cross the southern part of the permit area. The Garner Lake Road crosses the northwestern corner of the area.

The permit area is used mostly for grazing and wildlife habitat, with some dryland cropland. The southern part of the area adjoins the industrial complex of the Wyodak coal mine and powerplant.

A few ranch houses are on the permit area, and two new subdivisions are just outside the permit area--the Collins Heights subdivision in the S½SE¼ sec. 19 and N½NE¼ sec. 30, and the Fox Park subdivision in the NE¼ sec. 31.

A. MINING

The East Gillette Federal mine would use trucks and shovels to remove both overburden and coal from the mining-plan area. The area would be mined sequentially in rectangular pits, beginning in the southwest corner of sec. 9 (fig. A-1). Topsoil material would be removed for use in reclamation. A rectangular pit would be excavated to the coal in a series of benches 30 to 45 feet high. Initially, overburden would be stockpiled to areas south and east of the plantsite in sec. 8, where the coal has burned naturally (fig. A-1). Coal would be mined in benches following removal of the overburden. When sufficient volume has been removed from this initial pit to allow adequate space for simultaneous overburden and coal removal, overburden excavated from the leading edge of the active pit would be hauled to the back of the initial pit and dumped, producing, in effect, an advancing pit. At full operation, the advancing pit would be approximately 1,800 feet wide by 2,800 feet long. Haul roads within the pits would be along the sides of the pit and would, in general, allow level hauling of spoils. This sequence would be repeated when the second pit is opened.

The coal to be mined is from the Wyodak bed, which averages 81 feet in thickness, except where it has burned naturally and is partly or entirely missing (fig. A-2). Under most of the permit area, the Wyodak coal is separated into two beds by a shale split; the upper coal bed ranges in thickness from 20 to 50 feet and the lower coal bed from 20 to 60 feet, including a local shale parting about half a foot thick. The shale split between the upper and lower beds ranges from 2 to 5 feet thick except in the SW¼ sec. 29, where it exceeds 50 feet. The overburden averages 149 feet in thickness (fig. A-3) and consists of interlayered shale and sandstone.

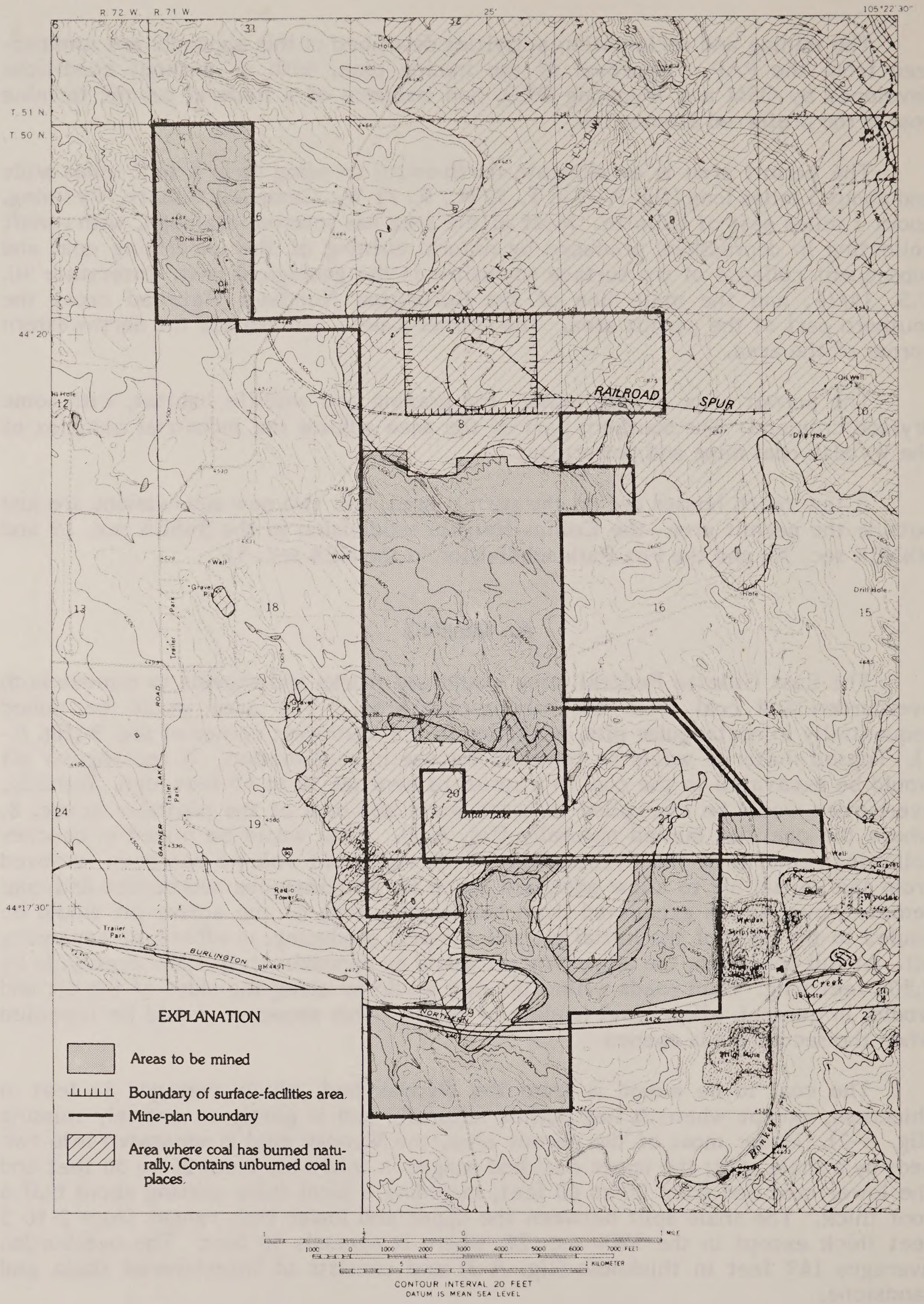

Figure A-1.--Areas to be mined at the East Gillette Federal mine. (Prepared from map furnished by applicant.)

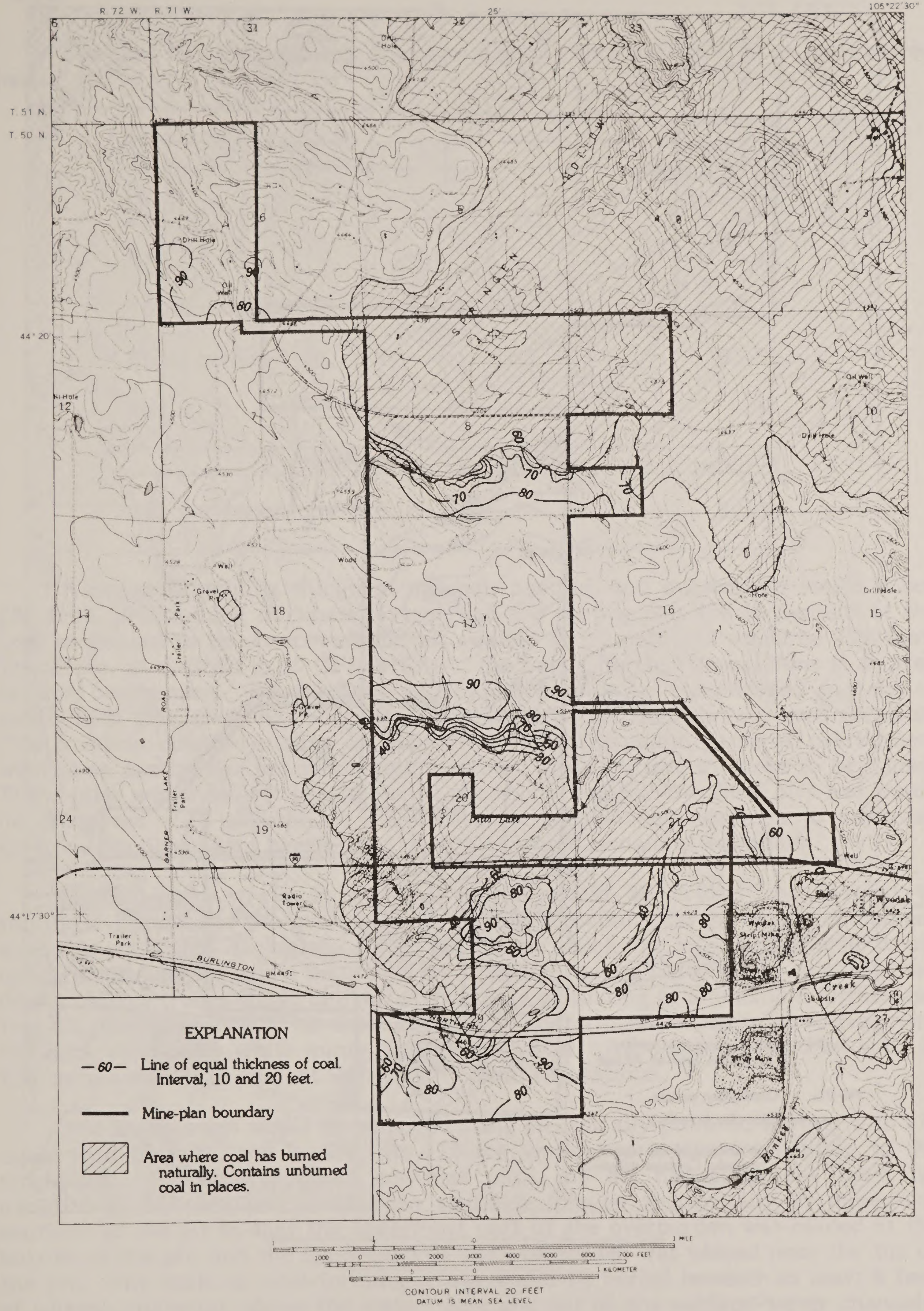

Figure A-2.--Thickness of coal at the East Gillette Federal mine. (Prepared from map furnished by applicant.)

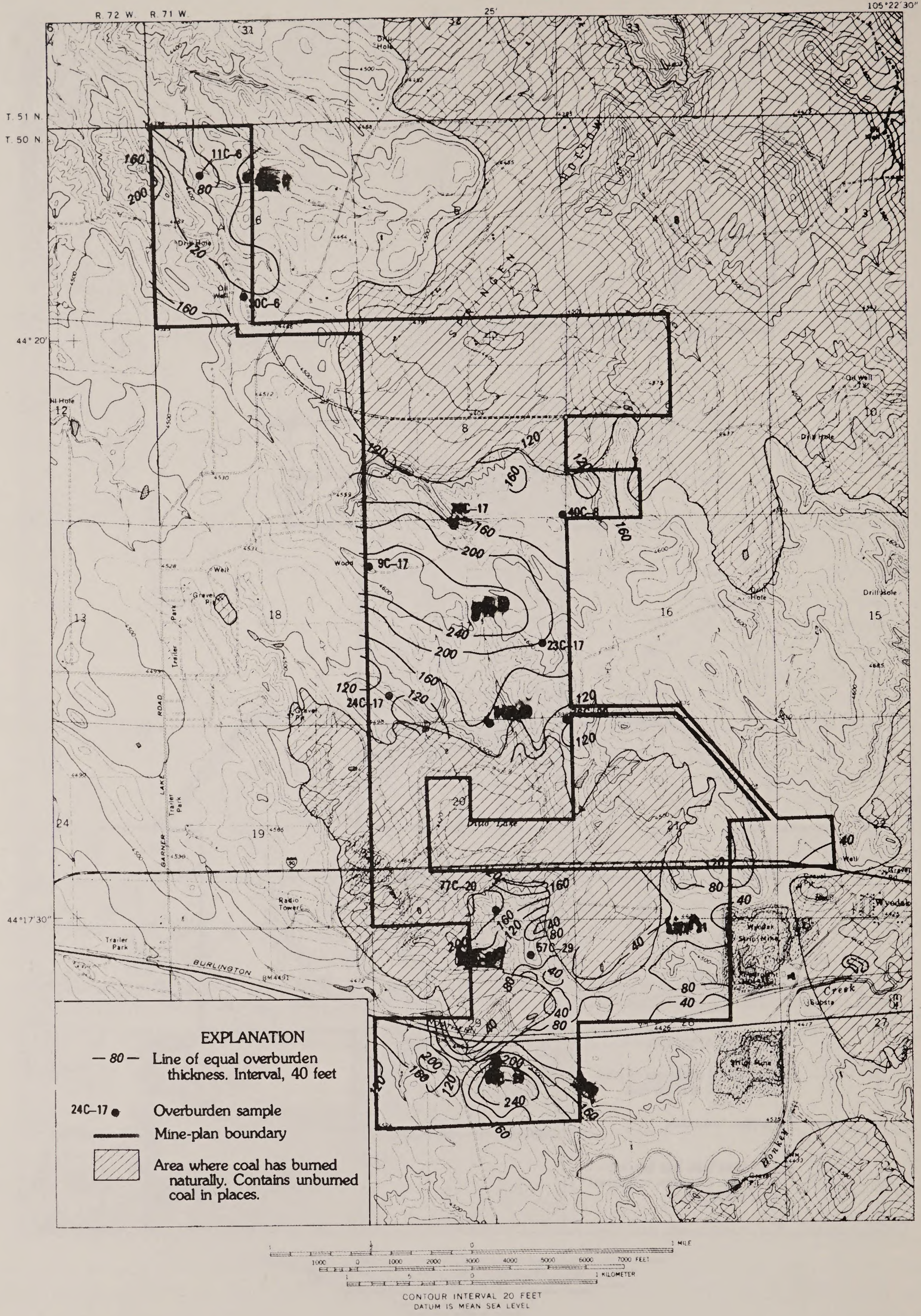

Figure A-3.--Thickness of overburden and location of coreholes from which samples were analyzed. (Prepared from map furnished by applicant.)

The coal has the following average quality characteristics on an as-received basis:

	Percent
Moisture	32.29
Ash	5.59
Volatile matter	31.10
Fixed carbon	31.02
Sulfur	.44
	Units
Btu per pound	8,100

Average premining thickness of coal, parting, and overburden totals about 235 feet. Postmining thickness (overburden and parting plus the 10 percent of the coal estimated to be unrecoverable, all swelled by 15 percent) would be 179 feet. Therefore, as defined in 30 CFR 816.104, the East Gillette Federal mine is an area of thin overburden. Because the overburden is thin, a complicated pattern of overburden movement has been devised to achieve the final surface configuration. This involves double-handling an estimated 54 million cubic yards of overburden, with some overburden being stockpiled on burn areas outside the area to be mined. These piles would be left in place until needed to backfill the final pits and would be protected with appropriate plant cover or mechanical measures to minimize erosion. No permanent overburden stockpiles would remain after mining.

Consolidated strata in the overburden would be drilled and blasted to facilitate removal of the overburden to expose the coal. Earth-moving equipment would level a 200- to 400-foot-wide bench on which the overburden drill would operate. Blastholes would be drilled on a predetermined pattern and to a selected depth. Mixer trucks would deliver an explosive consisting of ammonium nitrate and fuel oil. Each hole would be detonated in a predetermined order so as to fragment the rock efficiently while minimizing shock waves. All blasting would be done in full compliance with current State and Federal regulations.

The overburden would be removed using electrically powered shovels with 27-cubic-yard buckets, and loaded into 170-ton, end-dump trucks for hauling to the stockpiles. Stockpiling would continue until the pit had sufficient room for backfilling. Thereafter, overburden would be placed sequentially in mined-out sections of the pit so that the lowermost part of the overburden was placed at the bottom of the pit, and the upper part of the overburden was placed near the top of the pit. Any toxic or acid-forming strata would be buried beneath at least 8 feet of suitable material, above the water table and out of any surface-water channels, before topsoil is added. Where practicable, overburden storage piles would be located within the area to be mined to limit the total disturbed area. All temporary overburden storage piles would be identified with appropriate signs.

Like the topsoil stockpiles, overburden stockpiles would have slopes of 1v:3h or less. Stockpiles more than 50 feet high would be benched to reduce erosion. A ditch would be constructed around each stockpile at the toe of the slope to impound any runoff.

The coal would be mined in two or three benches, depending on the extent of the shale parting in the lower bed. The coal would be drilled and blasted where necessary and hauled by trucks to the primary crusher. Drilling would be done with rotary drills and coal would be blasted with an ammonium nitrate/fuel oil mixture. Electric shovels would be the prime coal excavators, although large front-end loaders may be used in place of or with the shovels. During the first year or two of operation, the coal would be hauled in the same end-dump trucks used to haul the overburden. At full operation, the coal would be hauled from the mine to the primary crusher in bottom-dump trucks.

To accomplish these mining operations, Kerr-McGee proposes to purchase the following equipment:

	Number
Electric loading shovels, 21-35 cubic yards	5
End-dump trucks, 170 ton	12
Coal haulage trucks, 120-200 ton	8
Bulldozers	9
Front-end loaders	2
Road graders	3
Scrapers	6
Blast hole drills	2
Water trucks	3
Mobile crane	1

B. RECLAMATION

The applicant proposes to restore the entire affected land to a postmining use of livestock grazing and wildlife habitat. Accordingly, the disturbed areas would be shaped into rounded hills and gently sloping surfaces that would blend into the adjoining topography. Most of the mining-plan area is now drained internally (fig. A-4) and a similar drainage pattern would result after reclamation. The applicant's estimate of the average costs for reclamation, in 1980 dollars, is $4,978 per acre.

A detailed soil survey of the permit area has identified the location and thickness of topsoil materials suitable for use in reclamation. Before mining or

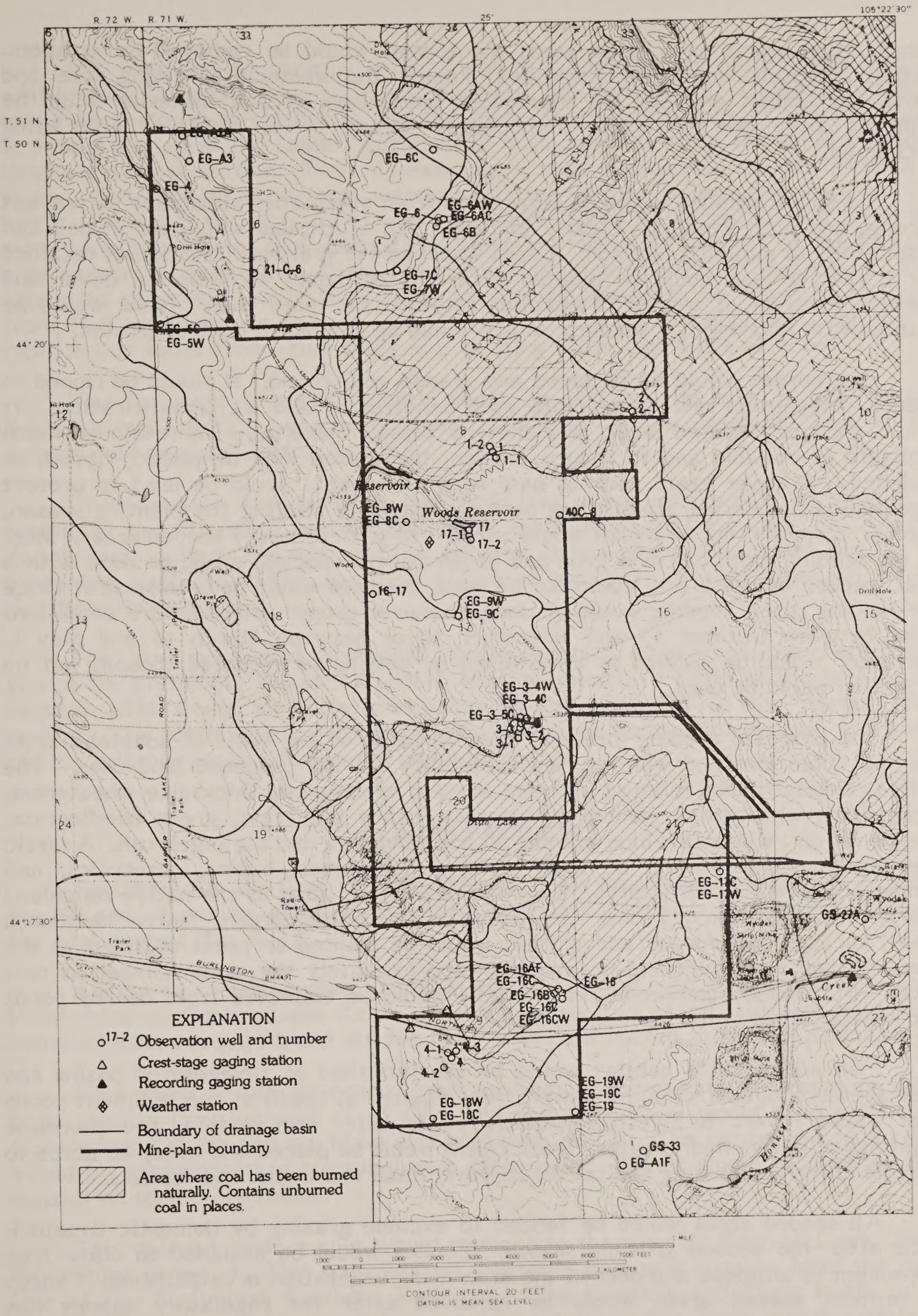

Figure A-4.--Drainage basins in the East Gillette Federal mine area and location of hydrologic monitoring stations. (Based on data furnished by applicant.)

construction starts on a given area, the topsoil would be removed by scrapers. Initially, topsoil would be stockpiled outside the immediate mining area and protected against erosion. In subsequent operations, topsoil material would be removed from one area and immediately spread on an adjacent area being reclaimed.

Topsoil stockpiles would be segregated from overburden stockpiles to prevent mixing, and both would be clearly marked. All stockpiles would be shaped and maintained to minimize erosion. Slopes would be 1v:3h or less. Stockpiles retained for 1 year or less would be planted with oats or barley to maintain cover and prevent invasion of weeds. Stockpiles retained for more than 1 year would be planted with native range species. Mulch would be applied to control erosion.

Overburden would be replaced and graded year-round. It would be ripped to reduce compaction and to promote root penetration and water infiltration. It would then be covered with 32 inches of topsoil material. To retain as much moisture as possible and to reduce erosion, the topsoil may be pitted, ripped, or mulched. A cover crop, such as oats or winterwheat, would be used to protect topsoiled slopes during off-planting periods (summer). During the planting season, a cover crop or crimped mulch would be used to protect newly seeded areas. Most of the seeding, both of cover crop and of permanent species, would be done with a drill seeder. Where a drill could not be used, the seed would be broadcast at twice the seeding rate. Seeding would be done whenever proper soil-moisture conditions exist between October 15 and November 30 or between March 15 and May 1. Fertilizer would be applied as determined by testing of respread topsoil, but no irrigation would be used.

The proposed seeding mixtures were selected on the basis of adaptability to the soil conditions and weather, and suitability for the proposed land uses. The native rangeland seed mixture includes western wheatgrass, thickspike wheatgrass, streambank wheatgrass, slender wheatgrass, canby bluegrass, green needlegrass, prairie clover, winterfat, blue grama, prairie sandreed, and big sagebrush. A mesic area seed mixture would be used along watercourses, basins, reservoirs, and temporary diversion structures. That mixture is the same as the native rangeland mix with the addition of rubber rabbitbrush and silver sagebrush. Native deciduous trees, such as cottonwood and willow, would be planted on areas adjacent to the reestablished reservoirs and drainages in approximately the same number as now exist. Bulrushes, pondweeds, and cattails would be collected from nearby ponds and reestablished in the permanent ponds.

Fish and wildlife habitat would be reestablished as revegetated basins and drainageways, upland shrub plantings, trees planted at heads of the sediment ponds that would revert to livestock/wildlife ponds after reclamation, and shoreline plantings of native hydrophytes. Rock cairns would be placed one every 40 acres to provide cover and nesting habitat for raptors, small mammals, and reptiles.

All seeded areas would be fenced to exclude grazing by domestic livestock until after the second growing season. Fences would be designed to allow free movement of antelope and deer in the area after vegetation is established. Fences to protect seeded areas would be removed after the regulatory agency has determined that the area has an adequate stand of vegetation that does not require further protection. Fences would not be removed if the vegetative production of the seeded area were less than 90 percent of the production on a comparable undisturbed native range control area.

The postmine topography would blend with surrounding natural contours as well as with the postmining contours of several adjacent mines. Drainage systems would be restored as closely as possible to premining conditions. Channels would be reconstructed in the same locations and with approximately the same meander length and cross section. The only existing through drainage on the permit area is in sec. 6, where an ephemeral waterway flows northward into Dry Fork of the Little Powder River (fig. A-4). This drainage would be reconstructed with the same premine channel characteristics. However, about 45 percent of the surface area presently draining to Ditto Lake would drain to another closed basin. The attendant reduction in runoff to Ditto Lake is estimated to be about 33 percent, from 21.5 acre-feet per year to 14.4 acre-feet per year. The applicant proposes to replace this water from other sources if existing water rights are affected.

Four permanent impoundments would be left on the area to provide for livestock and wildlife watering. Livestock access to the upstream part of the ponds would be restricted by fencing.

Ground-water conditions in the backfilled overburden would be similar to premining conditions. Local ground-water circulation patterns may be changed during mining, but are expected to recover to an equilibrium state similar to premining patterns. The quantity of water available is not expected to be significantly altered.

The upper portion of the backfill would simulate, on average, the characteristics of the premining Wasatch aquifer. High permeability zones at the base of the backfill lifts would simulate the water-holding potential of the present coal aquifer. The postmining ground water would be more highly mineralized, but would remain suitable for the designated postmining uses.

C. MINE FACILITIES

Facilities for the East Gillette Federal mine would occupy about 35 acres in the N½ sec. 8, which, although a part of lease W-0313668, is in a burned area off the coal deposit (fig. A-1).

Access to the mine area would be via an existing road connecting the Clovis Point mine to Garner Lake Road. The access road is paved, culverts have been installed where required, and ditches have been constructed to control drainage.

Haul roads would be constructed to meet requirements of Wyoming DEQ, Land Quality Division, and of 30 CFR 816.150-156. They would have a 100-foot traveled-way width and would be surfaced with scoria. The permanent haul roads would be sprayed with a chemical dust suppressant. Water would be used for dust control on temporary roads.

The railroad loadout spur would connect to the spur for Kerr-McGee's Clovis Point mine in sec. 9. This spur, in turn, connects to a spur running from the main line of the Burlington Northern Railroad to the Rawhide and Eagle Butte mines north of Gillette. The loadout spur would be built to the same specifications as mainline trackage. Unit trains would be owned either by Burlington Northern or by the companies contracting for the coal.

The service building would include maintenance shops, a lubrication bay, a warehouse, a first aid room, and offices for the mine staff. The warehouse would take up about half the building and would be next to the office. A tire shop and a change house would be built near the service building. All buildings would be of standard steel design and painted to reduce visual impacts.

Diesel fuel and engine oil would be stored above ground in tanks located a safe distance south of the service building. Gasoline would be stored in an underground tank, which, together with the pump, would be located in the service building area. A berm would be built around the out-of-doors tanks to control any spills.

Ammonium nitrate/fuel oil for blasting would be delivered to the site and stored in drop semi-trailers. Primers and other blasting materials would be stored in approved magazines. The ammonium nitrate tanks and the magazines would be located a safe distance from other mine facilities. The location would move as mining progresses.

Coal from the mine would be dumped into a receiving hopper above the primary crusher. A two-stage crusher mill would reduce the coal to less than 2 inches in diameter. A covered conveyor would lift the crushed coal to the storage barn or silos, which would have a capacity of 75,000 tons. The total system would be able to handle 3,000 tons per hour.

Electric power would be required at the minesite for drills and overburden and coal-loading shovels. Additional power would be required for the coal-handling plant, for train-loading facilities, and for the administrative, maintenance, and warehouse facilities. Power would be supplied by the Tri-County Electric Association, Inc., via a 69,300-volt primary transmission line. Two transformer substations would be installed at the mine's plantsite and pit areas to reduce voltage from 69,300 volts to 4,160 volts for use at the mine. The substations and powerlines would be located and constructed in accordance with acceptable standards to assure safety and minimize electrocution of birds and other wildlife.

D. WATER SUPPLY

The applicant estimates that a total of 182 acre-feet of water per year would be used in 22 of the 25 years of the mine's life, with lesser amounts being used during the other years. Of this, about 44 acre-feet would be used for domestic and sanitary purposes, steam cleaning of equipment, plant washdowns, and landscaping. This water would be obtained from a well tapping the Fort Union Formation at a depth of about 1,200 feet. The other 138 acre-feet would be used for dust control on haul roads; the applicant proposes to obtain some of this water from seepage into the active pit and from wells in the scoria aquifer. The amount of pit seepage would vary with pit location, but applicant data and observation of seepage in the adjoining Clovis Point mine pit indicate that the amount would be small. There fore, a large portion of the 138 acre-feet of water needed annually for dust control would have to come from the scoria aquifer.

E. WASTE DISPOSAL

Office and shop trash and other small items would be collected in closed containers. Large broken machinery and parts would be collected in a fenced junkyard. All trash would be buried at least 6 feet deep immediately after dumping in an approved disposal site at the Clovis Point mine or would be hauled away by a private disposal company.

Waste oil would be collected in a storage tank located within a spill-control berm. The oil would be sold and removed from the minesite.

A sanitary sewer system would be constructed on the mine's plantsite. A sewerline would connect the facilities to a small prefabricated sewage treatment plant consisting of a septic tank and drainfield. The system would be designed to treat sewage from the maximum work force of 331 employees.

F. DRAINAGE CONTROL

Most of the permit area has interior drainage because of large depressions formed by local burning of the coal (fig. A-4). Donkey Creek, in which perennial flow is maintained by the effluent from Gillette's sewage treatment plant, is located just south of the permit area and flows in an easterly direction. All other drainages in the area are ephemeral, flowing only in response to heavy rain or to snow-melt runoff. A channel in the W½ sec. 6, draining north into Dry Fork of the Little Powder River, is the only through-flowing drainage on the minesite. Several stock ponds and playa lakes, the most prominent of which is Ditto Lake in sec. 20, occur on the permit area.

Temporary diversion ditches would be constructed to channel runoff from undisturbed areas around the active mine pit and unreclaimed areas. These ditches would be designed for a maximum velocity of 5 feet per second and would be large enough to carry the peak runoff from a 10-year, 1-hour storm. Ditches would be seeded to provide stabilization. Where steeper slopes would result in locally increased velocities, riprap would be used to stabilize the channels.

Runoff from all disturbed areas would be channeled into sedimentation ponds with enough active capacity to hold the runoff from a 10-year, 24-hour precipitation event. The runoff would be held to allow suspended solids to settle out. Spillways for the ponds would be designed to pass the peak discharge from a 100-year thunderstorm without overtopping the embankments.

Pit seepage not immediately used for dust suppression would be pumped to a settling pond. This pond would be designed to store five times the estimated average daily pit pumpage.

G. HEALTH AND SAFETY

Operations at the East Gillette Federal mine would be subject to the regulations set forth in the Federal Coal Mine Health and Safety Act of 1969 and by the State of Wyoming. Kerr-McGee would institute a safety program at the mine to ensure safe practices and conditions.

All boundary fences and entrances to the plantsite and permit area would be marked by clearly legible signs displaying mine-property warnings. The mine area is partially fenced, and additional fences would be built as required. Fencing would be moved when necessary to accommodate ranching and to return reclaimed land to grazing.

Approved firefighting equipment would be installed in the shop and office areas and in the crushing and loading facilities. An adequate tank would be constructed to store water to serve fire hydrants throughout the area. All mobile equipment would be equipped with portable fire extinguishers to deal with equipment fires. Fuel and other flammable materials would be stored and transported according to approved safety regulations and procedures. Coal would be stored a minimum time to lessen the chances of spontaneous combustion.

All blasting operations would comply with the blasting laws covered by the Wyoming Environmental Quality Act and Federal regulations. The applicant would distribute a copy of the blasting schedule to local governments and public utilities, and would publish it in the Gillette News-Record. Public notice would be given prior to any changes in the schedule. Blasting would occur only during daylight hours except in emergency situations.

Every attempt would be made to comply with Federal and State regulations by incorporating the latest sound-control techniques and materials both in equipment selection and in the operation of the mine. Overburden and coal blasting would utilize delays to maximize fragmentation and reduce sound and vibrations. Also, a limited number of holes would be shot at one time.

H. MONITORING PROGRAMS

The East Gillette Federal mine area has been inspected and cleared for mining by the Wyoming SHPO. Onsite company personnel would be trained to monitor construction and mining so that any historic, archeologic, or cultural finds would be reported to the Wyoming SHPO.

The applicant would install a seismograph to monitor vibrations resulting from blasting. The applicant reports that monitoring of about 200 blasts at the Clovis Point mine shows that maximum peak particle velocity has not exceeded 1 inch per second, which is below the level that can cause damage to structures.

To complement the overburden analyses provided with the PAP, the overburden would be monitored during mining. About 50 additional coreholes would be drilled to provide data from at least one hole per 40 acres. If significant problems are found, additional holes would be drilled to determine the extent of the unsuitable material. This monitoring would precede stripping by 40-acre intervals, and would include analysis for pH, EC, and SAR. In addition, the highwall would be mapped and complete profiles prepared.

Prior to reseeding, topsoil material (particularly any that has been stockpiled for more than a year) would be analyzed to determine what treatment and amendments are needed to promote successful revegetation. Analyses would be made to determine available nitrogen, phosphorous, and potassium at a depth of 12 inches within the replaced topsoil.

Control areas that would not be disturbed during the life of the mine have been established for the major vegetation types that occur on the minesite. These control areas would be used to evaluate the success of the reclamation procedures. They would be managed the same during mining as before mining. The applicant is committed to achieving at least 90-percent parity in terms of cover and productivity.

The occurrence of wildlife on the minesite would be monitored in accordance with a program developed in consultation with Wyoming DEQ, Land Quality Division, and Wyoming GFD. (See appendix C.) Surveys would be made in January and February, April, and late June to early July. In addition, records of chance sightings would be kept. All wildlife sightings would be documented as to habitat type in which the animal was sighted.

Monitoring programs have been designed to detect the effects of mining and reclamation on the prevailing hydrologic balance both during mining and after reclamation. Overall postmining flow patterns on both the surface and within the reclaimed overburden would be essentially the same as premining patterns.

Recording streamflow gages have been installed on Donkey Creek upstream and downstream from the permit area and on the ephemeral stream in the northwest corner of the mine, one measuring inflow near the south edge of sec. 6, and one measuring outflow north of the mine in sec. 31 (fig. A-4). In addition, pairs of crest-stage gages have been installed on several drainages in the permit area. Streamflow data at these stations would be collected for the life of the mine and used to determine if any change in flow characteristics occur. Water samples would be collected at these stations for chemical and sediment analysis whenever flow occurs. If flows of long duration occur, samples would be collected monthly.

A number of observation wells were installed throughout the permit area as part of the premining hydrologic study (fig. A-4). Water levels are currently being measured in each well or well cluster on a monthly basis. Water samples are being collected quarterly for chemical analysis. If Wyoming DEQ concurs, and after baseline conditions have been established at each well, the applicant would begin collecting samples at a reduced frequency.

Wells destroyed by mining would be replaced as soon as reclamation of the well site is complete. The new wells would be completed with 5-inch casing, perforated, and gravel packed in the lower 30 feet of the reclaimed overburden. Since there would be no overburden aquifer distinct from a coal aquifer, only one well would be constructed for postmining monitoring at each cluster site shown in figure A-4.

A special monitoring system would be used as mining approaches areas of saturated scoria. When the pits are approximately 1,500 feet from the coal-scoria interface, monitor wells would be installed on 300-foot centers perpendicular to the interface. The resulting monitoring network should assist in establishing an adequate buffer zone of undisturbed coal and overburden sufficient to prevent accidental abrupt drainage of water from the scoria into the mine pit.

[illegible] They would [illegible] committed to achieving at least [illegible] in terms of [illegible] [illegible]ity.

[illegible] with [illegible] quality [illegible] type in which the [illegible].

[illegible] the effect of [illegible].

Recording streamflow gages have been installed on [illegible] and downstream from the [illegible] used to determine if any [illegible] would be collected at these stations for [illegible] tion analysis. If flows of [illegible].

A number of observation wells were installed [illegible] part of the [illegible] for chemical analysis. [illegible] collecting samples at a [illegible].

[illegible] well [illegible] penetration [illegible] there would be [illegible] Figure A-4.

[illegible] the interface. The resulting [illegible] adequate buffer zone of [illegible].

APPENDIX B

CORRESPONDENCE RELATIVE TO PRIME FARMLANDS

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Suite C - Centennial Center, 4th & Miller, Gillette WY 82716

SUBJECT: Prime Farmland in Campbell County

DATE: 11-30-78

RECEIVED
KERR-McGEE
COAL CORP.

TO:
Jim Fiorillo
Kerr-McGee Coal Corporation
Kerr-McGee Center
Oklahoma City, OK 73125

Dear Jim,

The Soil Conservation Service has determined that there is no Prime Farmland in Campbell County. This is due to a lack of moisture adequate to produce the commonly grown crops seven out of ten years.

However, after reviewing the soil data furnished by Darryl Maunder there are soils that would qualify for Prime Farmland if an adequate irrigation system were provided. The system would have to provide water of adequate quality and quantity.

The soils that would qualify are: Rauzi and possibly Fort Collins, Ulm and Bidman.

If we can be of further assistance please let us know.

Sincerely,

Richard L. Gray

Richard L. Gray
District Conservationist

Gerald D. Gavette

Gerald D. Gavette
Soil Survey Party Leader
Campbell County, WY

APPENDIX C

CORRESPONDENCE RELATIVE TO FISH AND WILDLIFE

LRT Land Resources Technology, Inc.

Land Restoration Engineering
Environmental Assessments
Permit Preparation

December 1, 1981

Mr. Vern Stelter
Wyoming Game and Fish Department
Box 6249
Sheridan, WY 82801

Dear Vern:

Enclosed are copies of the proposed annual wildlife monitoring programs for Kerr-McGee Coal Corporation's Jacobs Ranch Mine and the combined areas of the East Gillette Federal Mine and Clovis Point Mine. Your written evaluations of these monitoring programs would be greatly appreciated. Copies of these programs have also been sent to Harry Harju and Steve Tessman for their comments. If you have any questions please call.

Sincerely,

Jim Orpet

James E. Orpet
Director, Wildlife Division

np/JEO
encl

214 Sheridan Laramie, Wyoming 82070 Telephone (307) 745-3803

THE STATE OF WYOMING

ED HERSCHLER
GOVERNOR

Game and Fish Department

CHEYENNE, WYOMING 82002

EARL M. THOMAS
DIRECTOR

RECEIVED
12-7-81

JO

December 4, 1981

Jim Orpet
Land Resources Technology, Inc.
214 Sheridan
Laramie, WY 82070

Dear Jim:

The proposed annual wildlife monitoring program attached to your letter of December 1 will meet the annual monitoring requirements for WDEQ.

Keep in mind that small mammal and breeding bird surveys have to be run on reclaimed areas every 4 years, with control surveys at the same time on undisturbed areas. Also, any insufficient data in the state program renewals that has to be redone, if any, will be done as part of one year's monitoring program. Making up any insufficiencies will not be legal requirements until the state program is final, and none of Kerr-McGee's are final yet, so don't worry about that until next year. If you've been doing the work for Kerr-McGee, I doubt there'll be any insufficiencies, anyway.

Sincerely,

Vern

Vern Stalter
Environmental Biologist

KERR-McGEE COAL CORPORATION
KERR-McGEE CENTER • OKLAHOMA CITY, OKLAHOMA 73125

July 24, 1979

Mr. Robert Berg
Coal Coordinator
U.S. Fish & Wildlife Service
2120 Capitol Ave. Room 7009
Cheyenne, Wyoming 82001

Dear Mr. Berg:

At this time, the Kerr-McGee Coal Corporation has an application for the proposed East Gillette Mine pending with the Wyoming Department of Environmental Quality. In an effort to upgrade the wildlife section of our permit application we have become aware of the existence of an active golden eagle (*Aquila chrysaetos*) nest within one-half mile of our permit area.

The golden eagle nest is located on Donkey Creek approximately 4 miles east of the city of Gillette, Wyoming. Specifically, the nest is located in a cottonwood tree on the north bank of Donkey Creek in the SW¼NW¼NW¼ of Sec. 33, T50N, R71W. Our wildlife consultant, Dr. Larry Hayden-Wing, has personally inspected the site to confirm its active status. During his inspection on June 6, 1979, Dr. Hayden-Wing found a single young eagle about two thirds fledged.

Dr. Hayden-Wing has discussed this matter with Mr. Michael Lockhart who is a Raptor Specialist with the U.S. Fish and Wildlife Service in Sheridan, Wyoming. During these conversations Mr. Lockhart indicated to our consultant that mining activities at a distance of one-third mile would not be disruptive to the functioning of this eagle nest if precautions were taken to avoid human encroachment upon the nest site. Since the area in question is not within our permit area (The NW¼NW¼ of Sec.33 previously has been within our permit area. In our application resubmission, this parcel will be deleted) no mining activity will take place in the immediate vicinity of the nest. During critical nesting periods mine personnel will be advised to remain clear of the immediate area. No mining is projected in the S½ of Sec.28 until 1993. Our closest approach to the nest site will be in 1995 afterwhich mining will be moving away.

In view of the above information we would appreciate your evaluation of the potential for disruption of this golden eagle nest pursuant to your authority under the Bald Eage Protection Act as amended. If there are specific permits or clearance to obtain from the U.S. Fish and Wildlife Service please advise as to how we may obtain them.

Should you need further information please do not hesitate to contact me at 405-270-3724. I look forward to your response.

Sincerely,

Dennis Adamczyk

Dennis L. Adamczyk
Environmental Engineer

DLA/de

cc: R. Scharp
Larry Hayden-Wing ✓
Mike Lockhart

UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
2120 Capitol Ave., Room 7009
Cheyenne, Wyoming 82001

IN REPLY REFER TO:

August 2, 1979

Mr. Dennis L. Adamczyk
Kerr-McGee Coal Corporation
Kerr-McGee Center
Oklahoma City, Oklahoma 73125

Dear Mr. Adamczyk:

Thank you for your letter of July 24. Your interest in working with the Fish and Wildlife Service in the protection of the wildlife resource is appreciated.

Since the eagle nest you reported is not to be physically disturbed, it appears that no permit from the Fish and Wildlife Service will be required. However, we would like to see included in your mining plan a provision for avoidance, if possible, of the nest area during the nesting season. Also, as you suggested, mine personnel should be given instructions to avoid any encroachment on the nest.

Sincerely yours,

Robert H. Berg

Robert H. Berg
Coal Coordinator

RECEIVED
KERR-McGEE
COAL CORP.

United States Department of the Interior
OFFICE OF SURFACE MINING
Reclamation and Enforcement
BROOKS TOWERS
1020 15TH STREET
DENVER, COLORADO 80202

January 18, 1984

MEMORANDUM

TO: Wayne Brewster, Field Supervisor
Endangered Species, FWS
Helena, Montana

FROM: Robert Schueneman, Chief [illegible] H [illegible] For
Technical Support Branch, OSM
Denver, Colorado

SUBJECT: Biological Assessment for the East Gillette Mine

Attached is our assessment pursuant to Section 7 of the Endangered Species Act as amended. This assessment is based upon our field inspection, review of the permit application and previous assessments for similar Powder River Basin mines.

If you have any questions please contact Don Henne at FTS 327-5421.

Attachment

Biological Assessment pursuant to Section 7 of the Endangered Species Act of 1973 as amended, for the East Gillette Mine, Campbell County, Wyoming

Prepared by the Western Technical Center, Office of Surface Mining, Denver, Colorado

January 16, 1984

Introduction

During the preparation of the Environmental Impact Statement for the East Gillette Mine, OSM began to review available information regarding threatened and endangered species which could occur in the area. Based upon the numerous assessments OSM has prepared for similar Powder River Basin mines, the bald eagle (Haliaeetus leucocephalus), peregrine falcon (Falco peregrinus), and the black-footed ferret (Mustela nigripes) were considered potential inhabitants. On January 13, 1984, the U.S. Fish and Wildlife Service (USFWS) confirmed the accuracy of this list for OSM's biological assessment. The expected impacts from the East Gillette Mine on these listed species is presented below.

Proposed Action and Background Information

The proposed action is approval of a permit, with conditions, for the Kerr-McGee Corporation (KMC) to begin operation of a surface coal mine in Campbell County, Wyoming.

The mine would be located approximately 3 miles east of the town of Gillette and result in the disturbance of 2,604 acres over a 25-year period. Approximately 350 acres would be disturbed for the life of the mine for support facilities while coal recovery would require approximately 80 acres annually. The reclamation plan would return the area to the pre-mine uses, rangeland and wildlife habitat. A copy of KMC's wildlife mitigation plan is attached.

Assessment of Impacts

Black-footed Ferret

Current knowledge about this secretive mustelid indicates a close association with prairie dog colonies where this rodent is an important prey item for ferrets. During the small mammal surveys of the East Gillette site prairie dog colonies were not documented on or adjacent to the project area. Since there are no prairie dog colonies, the likelihood of ferret use of the site is remote. Based upon this data OSM has determined that the proposed action will not affect the black-footed ferret.

Peregrine Falcon

The only possible presence of this species in the project area would be a rare migrant during spring or fall. Due to this transient, if any, use of the area, the expected values for peregrine falcons would be perch sites and foraging area. Trees are rare on the project site and those disturbed through mining will be replaced during reclamation. In the meantime, power poles associated with the mine will be safe for raptor use. While mining will temporarily disturb potential foraging areas for falcons, the abundance of avian prey for migrating falcons will not be measurably affected. To date, raptor surveys of the area have not recorded any observations of falcons on or near the East Gillette site. Therefore, OSM has concluded that the proposed action will not affect the peregrine falcon.

Bald Eagle

The bald eagle winters in this region of Wyoming as the nearest documented bald eagle nest is some 60 miles away near Sheridan, Wyoming. Although a winter resident, there are no known winter roosts on or adjacent to the East Gillette site. This is due to the lack of suitable roost trees on or near the affected area. There are bald eagle roosts several miles to the south in the Rochelle hills and in small drainages where suitable cottonwood trees are available. It is possible that eagles from those roosts may forage in the East Gillette area but there are no regularly used feeding areas on or near the project site. Wintering eagles are opportunistic feeders and will utilize carrion as well as lagomorphs when available, so the disturbance of parcels of habitat will not measurably reduce potential prey sources. During the wildlife inventories for East Gillette there was one observation of a single bald eagle soaring over the area. Power poles associated with the mine will be safe for the rare, bald eagle which may pass through the mine vicinity. Using the above information, OSM has determined that the proposed action will not affect the bald eagle.

Summary

OSM has concluded that the proposed action will not affect species protected by the Endangered Species Act. The Wyoming surface mining regulations require KMC to report any observations of threatened or endangered species previously unreported. Where a conflict appears the USFWS will be contacted for a course of action.

References

Kerr-McGee Corporation, 1981, Permit Application for East Gillette Federal Mine, Volume IX, Denver, Colorado

Office of Surface Mining, 1981, Biological Assessment for six Powder River Basin Mines, Denver, Colorado

OPTIONAL FORM NO. 10
JULY 1973 EDITION
GSA FPMR (41 CFR) 101-11.6

UNITED STATES GOVERNMENT

Memorandum

TO : Robert Schueneman, Chief, Technical
Support Branch, OSM, Denver, CO
Attn: Don Henne

DATE: January 23, 1984

FROM : Field Supervisor, FWS, Endangered Species, Helena, MT

SUBJECT: Biological Assessment for the East Gillette Mine.

As requested in your memorandum of January 18, 1984, we have reviewed your biological assessment for the subject mine. Based upon the information you provided, we concur with your determination that the proposed East Gillette Mine will not affect the black-footed ferret, bald eagle, and peregrine falcon.

We appreciate your efforts to ensure the conservation of these endangered species as a part of your responsibility under the Endangered Species Act as amended.

Wayne G Brewster

5010-110

Buy U.S. Savings Bonds Regularly on the Payroll Savings Plan

APPENDIX D

CORRESPONDENCE RELATIVE TO CULTURAL RESOURCES

THE STATE OF WYOMING

ED HERSCHLER
GOVERNOR

Wyoming Recreation Commission

604 EAST 25TH STREET
CHEYENNE, WYOMING 82002

PAUL H. WESTEDT
Director
777-7695

COMMISSION OFFICERS
JACK O. OSMOND
PRESIDENT
P. O. Box 216
Thayne 83127
REGNALD BAFFORD
VICE PRESIDENT
P. O. Box 625
Lusk 82225
MRS. ROBERT FRISBY
TREASURER
2007 Newton Avenue
Cody 82414
MEMBERS
FLOYD BARTLING
P. O. Box 172
Douglas 82633
LYLE BENTZEN
1001 Pioneer Road
Sheridan 82801
MARVIN HARSHMAN
1507 West Spruce
Rawlins 82301
BILL NATION
2221 Van Lennen Avenue
Cheyenne 82001
ALBERT PILCH
1800 Morse Lee
Evanston 82930
DUANE REDMAN
Dubois 82513

May 20, 1976

Routing 5/25/76

CF

Lead Resp.

Mr. Daniel P. Baker,
State Director
State Office
Bureau of Land Management
P. O. Box 1828
Cheyenne, Wyoming 82001

Dear Mr. Baker:

Your May 18, 1976 letter, your reference 6230 (931) relative to preparation of an environmental impact statement on the Kerr-McGee East Gillette Coal Mine, has been received. The State Historic Preservation Officer regrets if the providing of archeologic clearance by the State Archeologist, rather than the recommendation that the Federal agency can--based on his survey and report--provide such clearance, has caused you difficulty with the operators of the proposed mine.

The S.H.P.O. concurs with the State Archeologist in the evaluation of archeological sites number 48 CA 12 and 48 CA 13. That is that one or the other, or both, might, following further study, prove valuable enough for enrollment in the National Register of Historic Places. This means that both sites should be protected from mining operations, and from added opportunities for vandalism resulting from such operations, until such time as a more intensive study and evaluation can be completed.

The only recognized historic site this proposed mining venture might affect is the Wyodak Strip Mine and Powerplant which it will bound on the north and west sides, and perhaps partially on the east side, in Sections 21 and 28. The Wyodak Mine possesses, we think, a potential for National Register enrollment. Certainly it is an historic operation and, since it predates the Environmental Policy Act, it may not be subjected to filling and landscaping when mining operations are finished. In that case, whenever the time arrives, it is probable that this agency will nominate it for enrollment in the National Register.

Mr. Daniel P. Baker
May 20, 1976
Page 2

With stipulation for protection of the forementioned archeological sites and consideration for possible effect on the Wyodak Mine--not likely to be adverse in view that the operations will be similar, the State Historic Preservation Officer recommends that the Kerr-McGee East Gillette Coal Mine can be approved for archeological and historical clearance.

Sincerely,

Paul H Westedt

Paul H. Westedt, Director
and Wyoming State Historic
Preservation Officer

PHW/mlr

cc: Mr. George Zeimens
Associate State Archeologist

DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT
MAY 25 AM 10:00
RECEIVED
CHEYENNE, WYOMING

March 3, 1849

United States Department of the Interior

BUREAU OF LAND MANAGEMENT
State Office
P. O. Box 1828
Cheyenne, Wyoming 82001

IN REPLY REFER TO
1793 (922)

SEP 1 1977

Mr. Frank Anderson
Environmental Impact Analysis Program
U. S. Geological Survey
760 National Center
Reston, Virginia 22092

Dear Mr. Anderson:

The Bureau of Land Management has completed compliance procedures under Section 106 of the National Historic Preservation Act of 1966 for the proposed Kerr-McGee East Gillette Coal Mine. Enclosed for your information and inclusion in the final environmental statement, is the letter from the Advisory Council on Historic Preservation concurring with our determination of no effect.

National Register Site 48 CA 12 was within the project area of the Proposed Kerr-McGee East Gillette Mine. The University of Wyoming received a research grant and fully excavated this site in June of 1977. The excavation allowed us to make the determination of no effect.

This action also completes 106 compliance for Site 48 CA 12 and its possible involvement with the adjoining Carter South Rawhide Coal lease.

Sincerely yours,

for Daniel P. Baker
State Director

Enclosure

CONSERVE
AMERICA'S
ENERGY

Save Energy and You Serve America!

Advisory Council on
Historic Preservation
1522 K Street N.W.
Washington, D.C. 20005

Routing 8/8/77 Initial & Date
SD
ASD
1
2
3
Lead Resp. /

August 3, 1977

Mr. Daniel P. Baker, State Director
State Office
Bureau of Land Management
P. O. Box 1828
Cheyenne, Wyoming 82001

Dear Mr. Baker:

The Council acknowledges receipt of a determination of no effect from the Bureau of Land Management for the proposed approval of the mining and reclamation plan for the Kerr-McGee East Gillette Coal Mine, Campbell County, Wyoming, made in accordance with Section 800.4(b) of the Council's "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R. Part 800). We shall retain this determination in our files.

You should keep this determination, along with adequate supporting documentation, as evidence of compliance with Section 106 of the National Historic Preservation Act and the Council's procedures.

A copy of the determination and supporting documentation should be included in any environmental assessment or statement prepared for this undertaking in compliance with the National Environmental Policy Act.

Thank you for your cooperation.

Sincerely yours,

Louis Wall

Louis S. Wall
Assistant Director, Office of
Review and Compliance

The Council is an independent unit of the Executive Branch of the Federal Government charged by the Act of October 15, 1966 to advise the President and Congress in the field of Historic Preservation.

THE UNIVERSITY OF WYOMING
DEPARTMENT OF ANTHROPOLOGY
UNIVERSITY STATION, BOX 3431
LARAMIE, WYOMING 82071

APR 1979
RECEIVED
KERR McGEE
COAL CORP.

April 18, 1979

Ms. Carol Wallace
Kerr McGee Corporation
400 So. Miller
Gillette, WY 82716

Dear Ms. Wallace:

The archeological site known as the Carter/Kerr-McGee site, 48CA12, sections 7 and 8, T50N, R71W in Campbell County, Wyoming was excavated in its entirety during the summer of 1977 under contract with the University of Wyoming. Monitoring of the area during 1978 and the spring of 1979 have revealed no remnants of the site left. Since none of the site remains, this letter constitutes archeological clearance of the site area as far as the State Archeologist's Office is concerned.

Sincerely,

George Frison

George C. Frison, Head
Department of Anthropology
Wyoming State Archeologist

GCF/tlc

Joe Wilson
Wyoming Recreation Commission

AUG 1979
RECEIVED
KERR-McGEE
COAL CORP.

THE STATE OF WYOMING

ED HERSCHLER
GOVERNOR

Wyoming Recreation Commission

604 EAST 25TH STREET
CHEYENNE, WYOMING 82002

JAN L. WILSON
Director
777-7695

COMMISSION
OFFICERS
MRS. ROBERT FRISBY
VICE PRESIDENT
2007 Federal Building
Cheyenne 82001
E. LAWSON SCHWOPE
TREASURER
900 Foyer Avenue
Cheyenne 82001

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Thayne 83127
ALBERT PILCH
1800 Morse Lee
Evanston 82930
CHARLES H. JOHNSON
1121 Alder
82301
MER

Lusk 82225

June 18, 1979

Mr. Dennis Adamczyk
Kerr-McGee Mining
Kerr-McGee Center
Oklahoma City, Oklahoma 73125

RE: Proposed East Gillette Mine

Dear Mr. Adamczyk:

As per our phone conversation of June 14, 1979, I have checked our records and find that all archeological work has been completed for the proposed East Gillette Mine. Archeological clearance is therefore recommended for the project with the stipulation that the Office of the State Archeologist be notified immediately if any cultural materials are encountered during top soil removal.

Sincerely,

Thomas K Larson

Thomas K. Larson
Associate State Archeologist

TKL:klm

cc: John Carlson, Wyoming Recreation Commission
Glen Mooney, DEQ, Sheridan, Wyoming

JUN 1979
RECEIVED
KERR-McGEE
COAL CORP.

MAY 20 1981

Jan Wilson
State Historic Preservation Officer
Wyoming Recreation Commission
State Historic Preservation Office
604 East 25th Street
Cheyenne, Wyoming 82002

ATTN: Mr. Thomas E. Marceau; Review and Compliance

Dear Ms. Wilson:

Enclosed you will find the material discussed over the phone between you and Jim Chase. This material relates to sites 48CA493, 494, 497, 498, 499 located on the Kerr-McGee East Gillette Mine.

It is our opinion that none of these sites are eligible for the National Register under any 36 CFR 60.6 criterion nor do they warrant additional work. In addition, we do not agree ~~with~~ the contractor's placement of these sites in a Paleo-Indian time frame based on locations.

Therefore, if you agree we would appreciate it if you would concur in a "Not Eligible" status for these sites. We would like to inform Kerr-McGee, as soon as possible, that no additional work is necessary.

If we can provide additional information or answer questions, do not hesitate to contact Jim Chase at (303)837-5656.

Sincerely,

DONALD A. CRANE

cc: Greg Smith, DEQ

Enclosure
bcc: OFC
Reading/RD
Chron
Chase/aw/4/13/81
retyped JEC:djw:5/13/81
finaled JEC:djw:5/14/81
refinaled JEC:djw:5/15/81

JUL 1981

THE STATE OF WYOMING

ED HERSCHLER
GOVERNOR

Wyoming Recreation Commission

604 EAST 25TH STREET
CHEYENNE, WYOMING 82002

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Director
777-7695

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1017 Victoria
Sheridan 82801

Mr. Donald A. Crane
U.S. Department of the Interior
Office of Surface Mining
Reclamation and Enforcement
Brooks Towers
1020 15th Street
Denver, Colorado 80202

May 28, 1981

RE: Archeological Test Excavating on Sites 48CA493 and 48CA494 at the Kerr-McGee East Gillette Mine (Project #AS-80-WY-1727)

Dear Mr. Crane:

The report submitted by Archeological Services concerning testing of sites within the Kerr-McGee East Gillette Mine permit area has been read. The following remarks are offered.

1. We do not feel that any of the sites mentioned in this report (48CA493, 494, 797, 798, 799) are eligible for listing in the National Register of Historic Places. We therefore concur in a Not Eligible status for these sites.

2. In our opinion, the "testing" program was overly ambitious and extended. Trenching operations barely intersected or approached the primary objectives (i.e. 48CA493 and 494 - see fig. 6 placements). If nothing else, the sheer weight of the negative data alone indicates that no further work is necessary at these sites or in this general area.

It is difficult to believe that after 361 meters (ca. 324 cubic meters of soil) of "evaluative" trenches were dug that the field archeologists could not reach a decision on whether sites 48CA 797, 798, 799 were eligible for the National Register (see site form

Appendix A). Of the 11 trenches, only 1 (#8) contained any cultural material. Even then, the 1.25oz. of bone fragments and 5 flakes appear less than significant considering the effort put into their recovery. If, as the authors state, "trenching is probably not the most efficient or effective method" of site evaluation, why was it chosen? If their testing program employing numerous linear trenches along both banks of the draw failed to yield any buried cultural material in more than 1% of the total excavated volume of soil, how do they substantiate their "impression" that "these sites may represent components of a larger, perhaps presently discontinuous, site that extends along both sides of the draw for some undetermined distance"? Given the nature of the recovered data, what is their rationale for a Paleo Indian period dating?

We believe that the Kerr-McGee Coal Corporation acted in good faith in having these sites investigated. We do not feel, based on the evidence presented in this report, that they are under any obligation to have any additional work performed at this time. The only condition warranting further archeological study would be the discovery of buried cultural remains during operation of the mine. Such procedures are adequately addressed in the current OSM regulations.

Sincerely,

Thomas E. Marceau

Thomas E. Marceau
Review and Compliance Section Head

FOR:
Jan L. Wilson, Director
and State Historic Preservation Officer
Wyoming State Historic Preservation Office

TEM:glb

cc: JLWILSON
MGJUNGE
TEMARCEAU
RF

108 Silverwood Drive
Bozeman, Montana 59715
December 15, 1981

Mr. Weber Greiser
Historical Research Associates
P. O. Box 7086
Missoula, MT 59807

Dear Weber:

On December 2 and 5, I examined all areas of sandstone and shale outcrops at the Kerr-McGee East Gillette Mine for the occurrence of vertebrate fossils. No fossils of any significance were found.

Each area indicated on the map and seen on aerial photographs was visited and considerable time and effort was spent examining good outcrops of poorly cemented sandstone and non-lignitic shales. Ant hills were examined carefully for small fossil mammal teeth and bone fragments where the ant hills occurred on good exposures. This method of examining ant hills has yielded some very significant small mammal sites in other areas of the Tertiary and Cretaceous of Wyoming and Montana. Fossil wood, modern snails and contemporary small mammal teeth were found but no fossil mammal teeth or bones were discovered.

My examination of these outcrops was thorough and seems to confirm the conclusion of other paleontologists (Carpenter, Antelope Mine, 1980; Lillegraver, personal communication; and Clemens, 1963) that well-preserved vertebrate fossils are not common in the Fort Union Formation in the Powder River Basin apparently due to acidic ground water conditions associated with the coal deposits.

In two days of intensive search, the only fossils found were a few fragments of snails and two unidentifiable fossil bone fragments probably associated with Quaternary deposits above the Fort Union outcrops.

Sincerely,

Michael W. Hager

Michael W. Hager, Ph.D.
Vertebrate Paleontologist

skm

APPENDIX E

CORRESPONDENCE REGARDING A CHANGE IN LAND USE

THE STATE OF WYOMING

ED HERSCHLER
GOVERNOR

Game and Fish Department

CHEYENNE, WYOMING 82002

EARL M. THOMAS
DIRECTOR

June 21, 1978

Tracy Cox
Mine Reclamation Consultants, Inc.
214 Sheridan
Laramie, WY 82070

Dear Tracy:

We have no objection to the change in land use from crested wheatgrass pasture and cropland to rangeland. As a matter of fact, we prefer that land use, since we do not believe crested wheatgrass is a boon to wildlife.

We believe that wildlife may be a problem on reclaimed areas unless the fencing also prevents their access to these areas. We certainly do not want permanent antelope-proof fencing in this area, but, logically, wildlife are going to be attracted to succulent, green vegetation. A 5-wire fence with a removable bottom wire 7 inches from the ground might minimize access by antelope. The bottom wire can be removed later to allow antelope access after two growing seasons.

We would prefer that the seeding mixture include sagebrush or rabbitbrush in addition to 4-wing saltbush. This can be added at the same seeding rate as the 4-wing saltbush.

Other than the above points, we have no objection to this proposal.

Sincerely,

Harry Harju

Harry Harju
Staff Game Biologist

HH:rv

CITY OF GILLETTE — CAMPBELL COUNTY

Department of Planning and Development

P.O. BOX 540 GILLETTE, WYOMING 82716 PHONE (307) 686-2222

August 2, 1978

Mr. Tracy L. Cox
Mine Reclamation Consultants, Incorporated
214 Sheridan
Laramie, Wyoming 82070

Re: Kerr-McGee East Gillette Mine, Proposed Land Use Changes

Dear Mr. Cox,

I am writing to you at the request of Gillette Mayor Michael Enzi regarding your letter of June 14, 1978 requesting our comments and views concerning the Kerr-McGee East Gillette Mine proposed land use changes. As you may know the City of Gillette has been actively involved in the State and Federal environmental review process on this and other proposed Campbell County coal mines. To date our comments have mainly addressed the areas of socio-economics, water table disruption, environmental effects on nearby population concentrations, railroad traffic and other miscellaneous concerns related to the provision of services to the people of Campbell County.

I understand from the materials you sent me that the only question addressed by this letter is the changing land use of 635 acres of "pasture" and 32 acres of "crop land" to "rangeland". We have no specific questions or immediate concerns relative to this change in land use. Our primary concern is that the vegetation, recontouring, replacement of top soil, etc., are performed in such a manner that will properly sustain plant and animal life after the reclamation process is complete.

Thank you for the opportunity to comment on this proposed change in land use. We are concerned with the reclamation process and would appreciate being provided with reclamation data after the process has begun.

Please don't hesitate to contact me if you have any questions.

Very truly yours,

Joseph A. Racine
Director

JAR/lgw
cc/ Michael B. Enzi, Mayor

CITY OF GILLETTE — CAMPBELL COUNTY

Department of Planning and Development

P.O. [illegible] GILLETTE, WYOMING 82716 PHONE (307) [illegible]

August 8, 1978

Mr. Tracy L. Cox
Mine Reclamation Consultants, Incorporated
[illegible]
Laramie, Wyoming 82070

Re: [illegible] East Gillette Mine, Proposed Land Use Changes

Dear Mr. Cox,

I am writing to you at the request of Gillette Mayor [illegible] regarding your letter of [illegible], 1978 requesting our comments and views concerning the [illegible] East Gillette Mine proposed land use changes. As you may know the City of Gillette has been actively involved in the State and Federal environmental review process of this and other proposed Campbell County coal mines. In these our comments have mainly addressed the areas of [illegible], water table disruption, socio-economic effects on county population and [illegible], railroad traffic and other [illegible] concerns related to the provision of services to the people of Campbell County.

I understand from the [illegible] you sent me that the only [illegible] addressed by this [illegible] is the changing land use of [illegible] acres of "[illegible]" and [illegible] acres of "[illegible]" to "[illegible]". We have no [illegible] questions or [illegible] regarding [illegible] to this change in land use. Our primary concern is that the vegetation, recontouring, [illegible] of the area [illegible] in such a manner that will [illegible] after the [illegible] is completed.

Thank you for the opportunity to comment on this proposed change in land use. We are [illegible] that the reclamation process and [illegible] being [illegible] with [illegible] after the [illegible] has begun.

Please don't hesitate to contact me if you have any questions.

Very truly yours,

[illegible]
Director

[illegible]
cc: Michael B. Enzi, Mayor

Bureau of Land Management
Library
Bldg. 50, Denver Federal Center
Denver, CO 80225